



# Orchestration of dreams: a possible tool for enhancement of mental productivity and efficiency

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## Abstract

Deciphering the significance of dreams, remains a dream till date. A little is known about its underlying mechanism, brain regions involved and implications with wake life. This review is aimed to investigate the latest developments to summarize the differences in nature of dreams in *Rapid eye movement* and *Non rapid eye movement* sleep, possible role of dreams in day to day life with larger focus on *Lucid Dreaming*- its significant role in elevating productivity and efficiency. To carry out this review, combination of keywords like *Lucid Dreaming*, *Rapid eye movement*, *Non rapid eye movement*, *Sleep Cycle*, *Dream Patterns*, *molecular mechanism of dreaming* etc. were entered in databases like National library of Medicine, Google Scholar etc. Nature and composition of dreams are distinct in different sleep phases and it tends to influence cognitive skills, memory consolidation, mood and personal temperaments. It was observed that dreams in distinct phases, can be directly/indirectly related to development of cognition, skill enhancements, learning, healing, and even stress management affecting overall performance and productivity of an individual. Understanding the nature of dream contents in different phases can possibly inculcate insights for not only recovery aid in several mental illnesses but for elevated efficiency and productivity in normal individuals as well. Realising dreams as an effective tool for its contribution in daily activities might help organising our mood and overall *mental well-being*, a foremost component to thrive in the contemporary world which is currently undergoing the chaos of *Novel Coronavirus Disease 2019*.

**Keywords** REM/NREM dream patterns · Lucid dreaming · COVID-19 pandemic · Coping stress · Anxiety · Mental well-being

## Introduction

Dreams can be considered an altered state of consciousness, a mental state experienced during sleep, embraced with images, thoughts, and emotions widely ranging in terms of nature from joyful to sad and sometimes making no sense at all. Dreaming is genuinely random and based on personal experiences, thus makes it difficult to devise a general aspect to culminate into the establishment of its functional role and universal importance [1]. Fortunately, it opens up an opportunity to minutely observe perceptions and diagnosis at individual level. Some people barely dream and some remember it in bits and pieces, unable to recall correctly [2]. In contrast, many people have been reported

to experience more vivid and lucid dreams (LD), and they are able to recall a storyline with every fine detail [3]. Few reported to control partially or fully their dreams [4], which has been often linked to the healing nature of *lucid dreaming*, better performance and productivity of the individual [5]. It was largely believed that dreams are specific to Rapid eye movement phase (REM) but later it was clarified that it can be experienced in the Non-rapid eye movement phase (NREM) as well thus, making it “*no unique*” to the REM of the sleep cycle [6]. Interestingly, it was opined that there is a significant difference in the nature of dreams among the two phases of the sleep cycle ranging from normal to less complex dreams in the NREM stage to lucid and vivid kind in the REM stage [7].

From curbing nightmares [8–10] to skill enhancement, problem-solving to creativity and mood upliftment to wish fulfillment [11], people have been reported to use LD as a tool to cope up with stress and eventually understanding the higher virtue of life [12, 13]. Dreams are truly based on

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personal experiences and temperaments, hence it holds the key to decipher a customized approach in healing the person, which would be more productive in recovery and restoration of his/her sound mental health effectively [14]. With all the importance and emphasis given to “*how dreams hold power to influence well-being and even spirituality*,” it should concern an individual to attain good amount of consistent sleep in order to reap its maximum benefits [15–17] and focussing on unlocking the phenomena of beneficial dream generations [10, 16].

### Sleep phenomenon at glance

It is inevitable to discuss dreams without mentioning sleep which is a complex and dynamic process and yet to be elucidated completely. It is considered a way of restoration and a must-have for good mental health as our productivity is largely influenced by it [18]. A sound sleep is directly related to our day to day well-being and a person lacking or having excess of sleep, either way, suffers the whole day for focus and productivity [19, 20]. It affects mental temperament in a negative way inviting restlessness, laziness and confusion, further leading to depression [20, 21]. In contrast, adequate sleep promotes focus, consciousness, better performance, and productivity [22]. Sleep has been categorized into two phases, Non-rapid eye movement (NREM) and Rapid eye movement (REM) [23]. The sleep cycle includes the three stages of NREM, followed by entry to the REM stage. Each cycle lasts about 1–1.5 h and we go through many rounds of such sleep cycles (approximately 5–6 cycles) throughout the night during our sleep, making 7–8 h as ideal sleep duration [2, 22].

### Dreams and the NREM phase

NREM is the first phase of sleep we enter, and it comprises 75–80% of one sleep cycle and also overall sleep [24]. It is broadly categorized into three stages i.e. stage 1 (N1), stage 2 (N2) and stage 3 (N3) depending on the rhythm of brain waves [25]. *NREM stage 1 or N1* is the initiation stage where a person enters into the sleep phenomenon, lasting about 1–7 min and here, the person can easily be awakened, thus a shallow stage. Alpha rhythms at this stage correspond to 8–13 cycles per second [26]. About 56% of the people have been proven to experience some mental experiences or dreams when awoken in this stage [27]. *NREM stage 2 (N2)* lasts approximately 10–25 min in the initial cycle of sleep but progresses to consume 50% of the total sleep cycle later in the night [28]. Stage 2 is a much deeper sleep state than stage 1 but individuals can be awoken with heavy stimulation. Throughout the night/sleep cycle the person spends maximum time in this stage [2]. *NREM stage 3 (N3)* lasts about 20–40 min and EEG is

characterized by high-voltage, slow wave frequency. This is the stage of ‘deep sleep’ and dreams are experienced in this stage as well but it is distinct in comparison to REM dreams [2, 29]. Interestingly, if awoken at this stage, people barely be able to recall or recollect any experience they had gone through due to the impairment in the interaction ability of the surrounding cortical neurons [30–32].

Previously, dreams were considered to be characteristic of *REM* and *N3* sleep but it’s not entirely true [6]. It was observed that some people were able to dream even during short naps, *N1* and *N2*, respectively but unable to recall the dream contents [27]. With the advancement of studies in the direction to decipher the differences of dream patterns between the *REM* and the *NREM*, many peculiarities have been established like dreams are “*not unique*” to the *REM* stage [33, 34]. In the case of *NREM* the recollection of dreams is up to 7–35% in comparison to *REM* dreams which accounts for 80% [27]. Dreams in this stage are more practical and less vivid, less narrative and hardly points to a storyline. It is typically fragmentary, hallucinatory [35] thought like, distinct emotional flatness [36, 37] and linked to our day to day concerns [22]. Emphasizing on memory consolidation during sleep, *NREM* dreams are more involved when compared to *REM* dreams [22, 38].

### Dreams in the REM phase

After the completion of stage 3 of *NREM*, the sleep cycle progresses to a paradoxical sleep stage in which the brain depicts exact brain rhythms/waves as if the person is awake. This stage is termed as active sleeping. Muscular atonia, LD are the characteristic of *REM* sleep [39–42]. This stage ranges from typically 5–10 min [43] up to 25 min and goes upto an hour later in the night [44, 45]. After this, a brief arousal occurs and re-entry to *NREM* occurs, thus initiating a new sleep cycle, such cycle continues throughout the night at least for 5–7 times [45].

During *REM* sleep, the individual experiences dreams, which are vivid and lucid, i.e. “the dreams are very clear and not blurred” and he/she is able to recall even the fine details. When we talk of “*lucid dream (LD)*” as a feature of *REM*, it has an extended and more pronounced meaning to it. *LD*, the term coined by Van Eeden in 1913, described as a “*dreaming state in which the person is aware of the fact that he/she is dreaming without withdrawing from the state of sleep*” [42, 46, 47]. In this stage, the bizarreness of dreams are very high [13]. It has been reported that a person can have partial to full control over the ongoing vivid dreams [2]. In comparison, *REM* dreams are of a more aggressive approach of the dreamer with high emotional and vivid contents [48].

## Dream role

Depression over the years have evolved and ever increasing like a hysteria in the modern world [49] and is more pronounced in women [50]. The world is already stressed out with the ever-increasing demands of the growing population ‘adding on’ the demands of pharmaceuticals [51, 52]. This calls for a conventional way to address certain behavioral turmoil, which we face in day-to-day life like “feeling low”, stress and anxiety on which mental well-being relies substantially but remains largely ignored [53, 54]. Though there are certain extreme degrees of such behavior like suicidal thoughts, self-harm and depression which suffering individuals are unable to contemplate [55, 56]. There is a need to understand and diagnose the severity of conditions [57] but unfortunately no potent algorithm has been devised till date to predict suicidality in medical practice [58]. Thus ‘powerful’ and ‘significant’ role of dream contents come into play in such situations as it has proven to be efficacious in predicting suicides [59, 60]. The dream elements of normal individuals, depressed patients and suicidal patients were analyzed and it was observed that in case of suicidal patients, the REM dreams are disturbed and have higher frequency of violence, gore and murder, indicating a common dream substance and patterns specific to such patients [60, 61]. Thus, dream contents (especially REM dreams) analysis can be helpful concoction speculating suicides and criticality of situation in these cases so that assistance can be reached to such patients with discernment [60, 62]. Several studies conducted in the past have hypothesised the linkage between LD and development of resilience indicating power of such dreams to develop a defence mechanism safeguarding mind from going into distress consequently helping in coping stress and trauma [14, 63]. To manage the emotional processes, REM dreams have been proven a handy tool, balancing the emotional memory consolidation while asleep [64]. In fact, limbic system activation has been well reported during REM sleep and accounts for the confirmation of REM dreams enhancing motivational mentation of the dreamer [65–67]. Interestingly, NREM dream reports have been indicated to be a major role player for memory consolidation during sleep in comparison to REM dreams [38], thus making NREM dreams “*not less important*”. The dreams, whether REM or NREM, both play a significant role in learning, reward seeking behavior and creativity [68]. Other cognitive abilities like reasoning abilities, aptitude and learning proficiency are directly related to the dream incorporation thus establishing a firm relationship between dream contents and new learning [69]. Further it is opined that the dream contents, especially LD, tend to develop a positive attitude and confidence building in wake life [70].

## Recent advances in dream mechanism

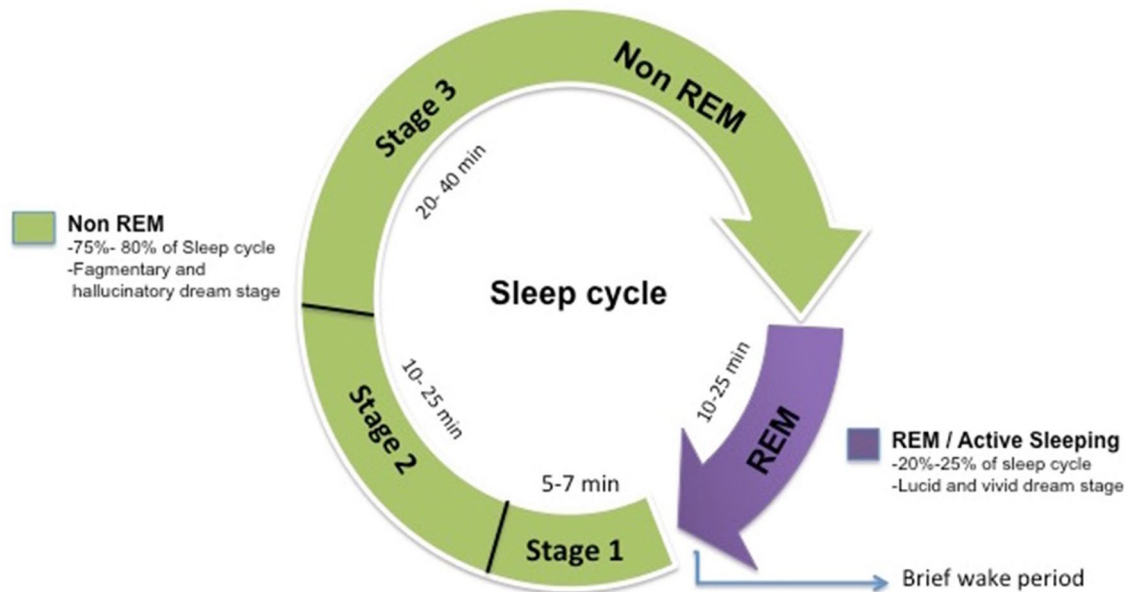
Recent advances in technologies like magnetic resonance imaging (MRI) have been proven to be very supportive in deciphering the neurophysiology of mechanisms like sleep and dreams. Different brain regions have been shown to be involved in REM and NREM sleep generation [34]. At cellular level, *acetylcholine muscarinic receptors Chrm1* and *Chrm3* proven to be crucial for REM sleep [74] and calcium hyperpolarization pathway facilitates NREM sleep [72, 74, 75]. Mechanism of dream, different types (REM/NREM dreams) and regions involved in it, largely remains elusive. Initial investigations have shown the involvement of prefrontal and parietal regions of brain in LD [76]. Some studies showed that frequent lucid dreaming is linked with increased functional connectivity between left anterior prefrontal cortex (aPFC) and bilateral middle temporal gyrus (MTG), right inferior frontal gyrus (IFG) and bilateral angular gyrus (AG) [75]. Recently it was demonstrated that the dreaming process is associated with decrease in local slow wave activity (SWA) in the posterior regions of brains in both REM and NREM [77]. Very less can be infer at this preliminary stage of research, therefore, neurobiology of dream mechanism largely remains an open arena for further investigations.

## Discussion

Due to the random nature and personal relevance of dream contents [78, 79], it has been difficult to construct a common theory justifying the possible function of dreams universally. Although with advancement in science and technology, many attempts have been taken and are taken to unlock the significance and underlying mechanism of dreams. Clearly, the nature, components and its pattern differ in both NREM and REM dreams which is briefly summarized in Table 1. Though researchers have long been interested in decoding REM dreams emphasizing on LD, a very less thrust has been given to NREM dream functions, which needs further contemplation to establish a global significance. NREM dreams have been proven to fecund memory consolidation and new learning while asleep. In addition, NREM dreams plays important role in proper functioning of the individual in day to day life (Fig. 1). On the other hand, REM dreams have attracted researchers all around to study its benefits and connection with not only sound mental health but mental restoration, creativity, and skill enhancement [16]. With anecdotal evidence and practices, a possible role from problem solving ability to healing has been propounded by incorporating LD practices. Since, it has been very well established how LD holds powers to influence mental health and overall temperament by mood upliftment of the person, myriad number of researchers studied and devised possible

**Table 1** A brief comparison between REM and NREM dream nature, contents and pattern [2, 4–10, 12–14, 22, 24, 33, 38, 45, 48, 67, 71–73]

Components/ Dream contents	Non-REM	REM
Sleep cycle duration	75–80%	20–25%
Sleep stages	Three stages; Stage 1, 2 and 3	Two stages: tonic and phasic
Dream types	Thought like, practical, less vivid, not much emotionally charged	Vivid and lucid, involving fantasies, Visualization of god, pleasure seeking and even nightmares, emotionally charged
Dreamer's Consciousness	Dreamer doesn't realize he is dreaming	Dreamer is aware that he is dreaming (LD)
Recollection	Very Low	Very high
Narration of the story	Fragmented, discontinuous	Narrative with a storyline
Bizarreness index	Less bizarre	High bizarreness
Emotional content	Low	Very high
Self-reflection	Lower	Higher
Aggressiveness	Low	High
Dream control	Not reported yet, more of hallucinatory nature	Can be controlled partially or fully
Possible role	Sound health and proper functioning in day-to-day life, Memory consolidation during sleep	In addition to sound health, Treatment of nightmares, skill enhancement, creativity, mood upliftment, meditation, and even healing

**Fig. 1** Typical sleep cycle with detailed stages of NREM and REM. Duration of each stage/phase is depicted in initial sleep cycles [24]

techniques to induce LD [80] [76] and constructed mechanisms to voluntarily control our lucid and vivid dreams. It also has been inferred that practicing LD can uplift performance and productivity in waking life. Some of the common and widely used techniques to induce LD are reality test (RT), Mnemonic Induction of Lucid Dreams (MILD) technique, Wake Back to Bed (WBTB), the Senses initiated lucid dream (SSILD) technique, and a hybrid technique combining substances from both MILD and SSILD [46, 80]. The individual can easily induce the above by following the

protocols at home with barely researching these techniques over Internet.

Innumerable individuals globally reported a disturbed sleep pattern during the present pandemic created by *Novel Coronavirus Disease 2019* (COVID-19) transforming them into insomniacs [81, 82] and risking mental well-being [83, 84]. A common pattern has been highlighted in several studies in past that during pandemics; the suicide rates tend to shoot up dramatically thus it urges immediate attention and call for the hour [85–87]. Unfortunately,



in this COVID-19 epidemic, we are witnessing surge in suicide rates and suicidal ideation, which has inflicted a suicide wave around the globe [87–90]. REM dreams are the prognosticator of suicidality [59, 60], accommodating early detection of such behavior. It may demonstrate to formularize a common notion determining the degree of seriousness of the situation and aid can be reached with a better understanding to the sufferers during this COVID-19 crisis.

Contrariwise, innumerable people are getting to sleep for longer duration allowing to spend more time in REM phase thus generating more REM dreams in comparison to the modern day sleep duration which is often quite short [91]. Dream mentation holds a great power to cope up with stress and it is applicable to diverse age group [92] therefore could be a supportive tool to address current COVID-19 catastrophe. In the context of this calamity, a proper and effective methodology needs to be devised and dissipated to make people aware about practicing LD around the globe with caution. This may ensure mental well-being amidst lockdown where mobility is restricted and health care systems stressed addressing needs to combat COVID-19 [93].

Some studies showed that the LD could be controlled partially or fully which in turn has ascendancy over meditative and inner healing capabilities. We learned that REM dreams could be more helpful in this regard, as LD being its distinctive feature, is instrumental in the improvement of wake life and can be induced via various means and practices. Dream contents have been shown to influence judgments, and its interpretation tends to affect day to day lives of individuals. Thus it is suggested here to draw its impact in “our favor” and building a more productive and skilled temperaments.

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## Compliance with ethical standards

**Conflict of interest** The author states no conflict of interest.

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