The International Journal of Indian Psychology
ISSN 2348-5396 (Online) | ISSN: 2349-3429 (Print)
Volume 9, Issue 3, July- September, 2021
DIP: 18.01.219.20210903, DOI: 10.25215/0903.219
http://www.ijip.in

Research Paper

The Evolution of Fear in Wakefulness and Dreams

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ABSTRACT

Fear is a primitive emotion, which helps us to steer clear of any potential dangers. In ancient times, fear helped our ancestors to stay alive and survive. Due to the mammalian evolution, the defense mechanisms that help to cope with dangers that threaten disruption in the transport of genes in transportation are successfully developed. In the mammalian environment of the past, the danger would strike quickly without a). The primary dangers were hunting predators, and natural events such as floods, thunder, and lightning. The most common strategies that were used were escape and avoidance. To survive, humans had to evolve a perceptual system to identify potential threats and dangers and a reflexive wired motor system to move away from the perceived danger. With time, the sensory and motor systems were expanded due to the sophisticated nervous system. Dreams can teach us about waking, dreams reflect reality. Nothing ever happens in the waking world until it happens in the dream world. In the dream state an individual can act out their inner desires which they can't in waking state. Carl Jung believed that dreams served us two purposes; firstly to compensate for the disparity in the individual's psyche and secondly to provide probable images of the future, which permitted the individual to predict future events. The threat stimulation system would be emerged in a surrounding influenced by the existence of crucial physical threats and naïve humans hence dream about realistic threat dreams that prepared their control of frightening physical surroundings. Since the time of evolution, humans rehearsed to respond to numerous threats with behavioral actions and this might explain why the reactions of the dreaming individual are mostly about running and fighting. In our contemporary society, most of the threats are emotional and psychological in nature. The threat that we face is very real but dissimilar to what was originally feared by early humans therefore the threat stimulation system gets activated but sometimes misses the mark.

Keywords: *Fear, Fear conditioning, Fear systems, Threat stimulation, Dreams, Dream Phenomenology*

One of the seven universal emotions is Fear which is experienced by all of us around the globe. We usually feel fear when we sense a threat that may harm us physically, psychologically, emotionally, real, or visualized. Though there is a negative connotation to fear, it is an important defense mechanism for our survival and to protect ourselves from potential danger. APA defines Fear as, "a basic, intense emotion aroused by the detection of imminent threat, involving an immediate alarm reaction that mobilizes the

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Received: August 09, 2021; Revision Received: September 21, 2021; Accepted: September 30, 2021

organism by triggering a set of physiological changes. These include rapid heartbeat, redirection of blood flow away from the periphery toward the gut, tensing of the muscles, and a general mobilization of the organism to take Fear differs from anxiety in that the former is considered an appropriate short-term response to a present, clearly identifiable threat, whereas the latter is a future-oriented, long-term response focused on a diffuse threat. Some theorists characterize this distinction more particularly, proposing that fear is experienced when avoiding or escaping an aversive stimulus and that anxiety is experienced when entering a potentially dangerous situation (e.g., an animal foraging in a field where there might be a predator). Whatever their precise differences in meaning, however, the terms are often used interchangeably in common parlance."

It is a primitive emotion, which helps us to steer clear of any potential dangers. In ancient times, fear helped our ancestors to stay alive and survive. Fear works on two different reactions, biochemical and emotional responses. The biochemical response is when your body responds physically, as your heart rate increases, you sweat and there are high levels of adrenaline. This is when your auto-response of fight or flight gets activated. The second is an emotional response, this is a personalized fear. Some automatically seek out this fear, whereas some don't.

History of Fear

The life of early humans was dangerous and uncertain. There were countless dangers of wild beasts that could be seen, and which may kill you, and also other creatures which can't be seen but are dangerous. For the humans, the different phases of the moon seemed mysterious, it maddened them with lunacy. They were terrified of thunder, lightning, solar eclipse. They could hear and see these phenomena but not fully understand them. This became a source of fear between the known and the unknown. Otherness was born, when people could not understand a different language, it made one afraid of that particular person or tribe. There were numerous things humans were afraid of and the creation of beliefs and rituals helped to make sense of the world and to diminish their effects. Even if the rituals did not have good reasoning and logic behind them, it didn't matter because the belief seemed to help. Death was, of course, the biggest threat keeping aside the fact that death is inevitable; we humans have come up with countless beliefs, rituals, and faiths to explain this phenomenon and prolong our life on earth. We see in the past, there were things that one should be fearful about: Attack on medieval cities by plunderers who invaded and looted cities, robbers on a highway who did waylay travelers. The fear of witches was really big during the late sixteenth and early seventeenth century in parts of Northern Europe and America. An estimated count of 40,000 to 60,000 people was put to death (mostly by burning at the stake) most of whom were women. The witches were blamed for all the disasters happening around, from crop failures and economic dislocation to famines.

When it comes to a potential threat and risk, we mix up our perceived notion of superstitions, logic, and reasoning. Our mind oscillates from "real" dangers and imagined dangers, paranoia, and panic, between anxiety and phobia. Despite all the safety measures taken in a flight, most of us still have an irrational fear of flying. In the past, fear was a significant tool that helped to survive but in our modern times, it is becoming more of an inner struggle.

Fear Systems

Due to the mammalian evolution, the defense mechanisms that help to cope with dangers that threaten disruption in the transport of genes in transportation are successfully developed. In the mammalian environment of the past, the danger would strike quickly without a warning (Tooby & Cosmides, 1990). The primary dangers were hunting predators, and natural events such as floods, thunder, and lightning. The most common strategies that were used were escape and avoidance. To survive, humans had to evolve a perceptual system to identify potential threats and dangers and a reflexive wired motor system to move away from the perceived danger. With time, the sensory and motor systems were expanded due to the sophisticated nervous system. Stimulus and response worked better by insertion of central motive state between the two. The activation of the motive state from the innate danger stimuli serves to aid escape through tailored flexible responses to contingencies of the environment (Archer, 1979). Fear is the central motive state, whose essential characteristic is to motivate avoidance and escape (Epstein, 1972).

With the help of subtle cues from potential disastrous events, fear can be conditioned (Rescorla & Solomon, 1967) which further promotes flexibility between the stimulus and its response. The fear module proposed by Ohman and Mineka consists of four characteristics, which are all assumed to be shaped by contingencies of evolution.

Selectivity-

The Fear module is in simple words, a tool for activation of defense behavior i.e., fight and flight response which is grouped with any psychophysiological responses and emotional feelings that may be revoked due to a threatening stimulus. A requirement for evolving behavior systems is their relative selectivity in correlations to the input of the response. Instead of being open to any stimulus, the fear module limits the sensitivity to a particular stimulus, which was perceived as threatening in the past. With the limitation of affective stimuli, neural mechanisms that already exist can be used to identify critical events which would aid rapid initiation of the defense mechanism with minimal neural processing. Through the process of Pavlovian conditioning, the fear module can be spread out which will enable the stimuli to predict and initiate the module power. (Domjan, 1983; Garcia, McGowan & Green, 1972; Revusky, 1977; Seligman, 1970; Seligman & Hager, 1972). The recurrent threats aid fear learning, whose presupposition would be that situations defining such fear would be easy to identify and to promote avoidance of danger. Although evolutionary fear stimuli adhere to be advantageous, associations between subliminal cues and fear are not prohibited but it would be difficult to learn.

Automaticity-

The origin of animals with primitive brains has deep-seated evolutionary modules for behavior that are involuntary and directly bring forth stimuli. Therefore, the behavior seems to be elicited and the stimulus is likely to be represented in consciousness. The characteristic of preconscious automaticity, which refers to trigger responses in the absence of conscious awareness of the stimuli event, is shown by evolutionary fear-relevant stimulus (Bargh, 1989). Automaticity may be of an evolutionary origin but it is also suggested that with extensive training, automaticity of mental function can be achieved (Shiffrin & Schneider, 1977). Even if the learned automaticity is pitched against evolutionarily derived automaticity, it is crucial to recognize the need for frequent extensive experiences to shape neural architecture (Elman et al., 1996).

Encapsulation-

The third featured of the fear module is encapsulation which means that it is comparably dense to other modules with which it lacks any direct connections (Fodor, 1983). Hence, activated, the module runs its course without much interference from other processes. In particularity, the evolutionary shaped modules will show resistance to conscious cognitive influences as their origin precedes the recent evolving events as the emergence of conscious thought and language. It may seem like encapsulation is relatively similar to automaticity, however, automaticity initiated the activity whereas encapsulation maintains the activity over the period. To give an example, behaviors can sometimes be automatically elicited and quickly reimbursed for by voluntary acts. For example, facial responses that were assessed by electromyogram was appeared to be elicited by a particular stimulus even if it was not perceived consciously (Dimberg, Elmehed, & Thunberg, 2000).

Specific neural circuitry-
An evolutionary module is controlled by a specific neural circuit at the neural levels, which has been shaped by evolution as it transmits the functional relationship between behavior and ecological events. Modules of ancient evolutionary origin have their brain circuits located in the subcortical or even the brainstem areas. Neural circuits for fear and fear learning in mammals has been described in significant discoveries made by investigators (Davis, 1992; Davis & Lee, 1998; Fanselow, 1994; Kapp, Whalen, Supple & Pasco, 1992; Lang, Davis & Ohman, 2001; LeDoux, 1996; Rosen & Schulkin, 1998). Organized around the limbic structure (the amygdala), in the medial anterior temporal lobe that transmits input from cortical and thalamic areas to hypothalamic and brainstem nuclei that command different aspects of overt fear behavior. Indeed, the brain workings that generate fear and the assessment of stimuli are unconscious and automatic, just as any other organs' workings whereas the experience of fear is conscious (Rosen & Schulkin, 1998, p. 326).

Fear and Fear Conditioning

Fear is an aversive state of emotion is induced by external cues of threat which activates the defensive fear module of the organism. This fear module later puts together a behavioral pattern to adjust to the potential threat. Hence, fear plays an important part in the survival of the organisms as it prepares them for escape and motivates avoidance. As described in the predator imminence model (Fanselow, 1994; Lang et al., 1997) escape and avoidance are likely to be the endpoint of dynamic defense response. According to this model, with the increasing juxtaposition of the threatening or dangerous stimulus the activation of the fear system increases. Immediately after detection of the threat, the organism freezes and undertakes higher vigilance towards the threat. As the threat cue comes closer to the vicinity, there is an increase in the intensity of the fear response which mobilizes energetic sources for escape. After reaching a particular stage of proximity (the so-called circa-strike period) the being escapes or (if the escape option doesn't work) initiates fight or flight mode or (if the attack is not possible) complete immobilization takes place i.e tonic immobilization (Marks, 1987). The intensity of the fear response lowers down as soon as the threatening cues disappear (Marks, 1987). It is proposed that the fear module aids useful biologically as it allows the organism to detect the threat and activate the defensive behavior automatically to adapt to it (Schupp H.T et al., 2005).

According to a neuroimaging study by Moratti, S., Keil, A., & Miller, G. A. it seems unclear whether the augmented cortical processing is due to anticipation of an aversive happening alone or due to fear system activation. The purpose of the study was to investigate the autonomic and cortical responses of mindful participants who used an instructed fear conditioning design. Changes in the heart rate and the Steady-state visual evoked fields (ssVEF) were documented to assess sensory processing and the fear system activation by the non-reinforced stimuli (CS-) and reinforced (CS+). Those participants who displayed accelerated heart rate showed increased ssVEFs in the parietal and visual cortex during CS+

in acquisition trials. The individuals who portrayed slow acceleration of heart rate showed an increase in ssVEFs in the parietal and visual cortex during CS+ in trials of acquisition. The ones with deceleration in the heart did not show any cortical activation in regards to the CS+. In the study, participants in both groups demonstrated awareness of CS-US contingencies. In fear conditioning awareness of the stimulus, contingency is not enough to elicit augmented visual cortical processing. (Moratti, S., Keil, A., & Miller, G. A. 2006)

It is said that fears can be acquired and the process of this acquisition is referred to as a form of conditioning. Association of neutral stimuli with pain or fear-producing situations evoke fearful qualities i.e., they become fear CS's. The determination of the strength of the fear is shaped by the intensity of the fear/pain experienced by the stimuli and also the number of repetitions of the association between the stimuli and the fear/pain situation. If the stimuli resemble the fearful properties of the fear-evoking ones then they become secondary CS's. Confinement increases the chances of developing fear. by exposure to the fear/ and painful situations to high intensity and by numerous repetitions of the association amid the new CS and the pain/fear. A secondary fear drive unfolds when proposed that the objects or situations develop motivating properties once they acquire fear-provoking qualities. There is an increase in strength when behavioral patterns like avoidance actions reduce fear (Rachman, S., 1977).

One of the most useful behavioral paradigms is the Pavlovian fear conditioning which explores the molecular mechanisms of memory and learning as a clear-cut response is produced through associative learning processes by a specific environmental stimulus. In the lateral nucleus of the amygdala lies the synaptic plasticity which undertakes the form of associative learning. LeDoux summarizes the form of fear conditioning that is best understood at the molecular level, i.e., the synaptic plasticity in the frame of reference of auditory fear conditioning which is contributed by the molecular mechanisms. The study further discusses the three stages of fear conditioning- acquisition, consolidation, and reconsolidation which are contributed by the neurotransmitter system and the signaling descend(Johansen, J. P., Cain, C. K., Ostroff, L. E., & LeDoux, J. E., 2011) We are suggested by this study that interaction of multiple intracellular pathways, together with activation of Hebbian process and neuromodulatory receptors produce neural plasticity in the lateral nucleus of the amygdala and behavioral fear conditioning. Collectively, this study illustrates the impact of fear conditioning as a module system for characterizing the workings of memory and learning in mammals and potentially for identifying and understanding fear-related disorders, such as PTSD and phobias.

Neural Organization of Fear

The amygdala, which is a set of neural nuclei, is in front of the hippocampus at the top of the temporal lobe, which appears to be a central neural structure for the regulation of fear. There is a production of fear typical behavior (e.g., freezing and autonomic responses) in animals including humans due to the electrical stimulation of the amygdala (Applegate, Kapp, Underwood, & McNall, 1983). Therefore, we can see that the amygdala controls any kind of overt fear- behavior manifested from its central nucleus (Davis, 1992). The amygdala's central nucleus conveys to the midbrain periaqueductal gray (PAG), the hypothalamus and the brainstem which manage various defensive response like the defensive fight, flight, freezing, avoidance reactions, tonic immobilization, submissive postures, autonomic arousal, and hypoalgesia. These neural circuits can be initiated either by conditioned stimulus or unconditioned (Misslin, R. 2003)

From the perspective of evolution cognitive functions are mostly explained as functionally non-dependent modules instead of in terms of mechanisms of general purpose. Designed by evolution, these modules are likely to be rapid, automatic, and specific to domain cognitive systems which aid to solve certain adaptive problems that are confronted repeatedly in the environment. According to evolutionary neuroscience, in the mammalian brain, the amygdala is recognized as the central structure of a modular system which is shaped by evolution to react to stimuli that are of threatening or dangerous in nature. When a threatening stimulus is confronted, the amygdala receives the cortical representation of fear through the insular cortex which leads to fear expression. A study states that the ordeal of anxiety and fear is controlled by a modular neural system in which the amygdala plays a pivotal role. To this statement, Ohman and Mineka argue that the amygdala is considered as a fear system, that since ancient times, primitives have been used for survival and has an evolutionary origin. (Sander, D., Grafman, J., & Zalla, T. 2003). The fear system is a device for initiating defensive mechanisms and associated psychophysiological response and feelings of emotion to frightening stimuli. The amygdala plays a crucial role in learning to integrate fear responses with neutral stimuli, as disclosed by conditioning experiments done on animals and humans ((Sander, D., Grafman, J., & Zalla, T. 2003). Therefore, we see that even if the amygdala detects progressive primary fear-related stimuli due to its genetic programming, it also allows initiating fear response of a wide range of stimuli through the means of associative learning processes. A study using functional magnetic resonance imaging exhibited that through projections from the posterior thalamus and the superior colliculus, visual information can reach the amygdala (Morris et al., 2001). Further in the study, it was demonstrated that a patient with unilateral striate cortex damage was capable to distinguish emotional facial expressions introduced in his blind hemifield. Also, when an angry face was paired with an aversive tone it showed an increase in the blood oxygen levels in the right amygdala which had a positive correlation with the initiation of the posterior thalamus and the superior colliculus. Hence, this study shows us that the fear module can be initiated without any complex cortical processing of the stimulus which receives access to this fear module (Schupp H.T et al., 2004). According to a study by Rogan and LeDoux (1995), when stimulation of high frequency was given the medial geniculate body presented long term potentiation of neurons which transfers auditory information about the conditioned stimuli in the lateral amygdala (e.g., Bliss & Collingridge, 1993; Malenka 7 Nicoll, 1999). In another study (Rogan, Staubli & LeDoux, 1997) demonstrated that the Pavlovian conditioning approach used by LeDoux (1996) modified the electrical field potential from the population of neurons. Therefore, neuron responses in the population of the neurons increased, just so there is a decrease in extinction while the behavioral response waned as the conditioned fear was made apparent at the behavioral level. The studied changes were precisely related to the establishment of associations amid the conditioned stimuli and the unconditioned electrical activity in neurons of the lateral nucleus because as we see such changes could not be demonstrated in animals due to the unpaired exhibition of the conditioned and unconditioned stimuli. Thus, we can conclude that associative emotional learning can be related to neuronal changes taking place in the lateral amygdala.

As we have been seeing, the amygdala seems to be a significant neural structure for the fear system. At first, it plays a big role in triggering fear in mammals including humans. The activation of the amygdala seems to be carried out with a neural route that does not involve the cortex. The neural circuit described seems to work well in demonstrating behavioral characteristics of the fear system. It can be seen that there is a rapid activation from an incomplete processed stimulus via the thalamus- amygdala link, the automaticity of the fear system is counted for the amygdalar fear circuit. The amygdala starts to take on the fear response when the particular thalamic and midbrain structures experience critical stimulus features. We are provided a simple explanation for the efficacy of concealed unreported fear-relevant stimuli to initiate fear responses (Ohman, 1996; Ohman, Flykt & Lundqvist, 2000). This is why human autonomic responses could be conditioned to concealed, unreported fear-relevant stimuli because the thalamus-amygdala passage is crucial for fear learning (Esteves, Parra, et al., 1994; Ohman & Soares, 1998)

Accordingly in the amygdala, fear learning and fear activation are easily divisible from the demonstrative acquisition of information through the hippocampus (Bechara et al., 1995), even if there is an enhancement in the hippocampal memorization of incidents (Cahill & McGaugh, 1998). LeDoux further elaborated that the neural circuit for fear has extensive effects on complicated cognition, although the amygdalar circuit is fairly immune to conscious cognitive control. In a study by LeDoux (1996), he explains that neurons in the amygdala whose function is to process the prepared stimuli, do have prewired but an ordinarily impotent association with cells that control the emotional response This statement can be conveyed properly by the computational model of fear conditioning explained by Armory and LeDoux (Armory, Servan-Schreiber, 2000; Cohen & LeDoux, 1997). The planning of this model includes modules plotted on the anatomical form of fear learning described in LeDoux's (1996) work, and their linkage depicts the anatomical connectivity perceived in the brain.

Fear in Dreams

The threat simulation theory says that the role of dreams is to prepare for threatening situations, which aided advantageous for our ancestors for their survival. I recall something I read about dreams, that one should know the meaning of the dreams. Dreams can teach us about waking, dreams reflect reality. Nothing ever happens in the waking world until it happens in the dream world. In the dream state, an individual can act out their inner desires which they can't in a waking state. Carl Jung believed that dreams served us two purposes; firstly to compensate for the disparity in the individual's psyche and secondly to provide probable images of the future, which permitted the individual to predict future events.

Man has not been able to describe the neural correlation and function of REM (Rapid- Eye-Movement) sleep. REM is correlated with extreme neuronal activity, ocular saccades, muscular atonia, and dreaming. A study (Maquet, P., Péters, J. M., Aerts, J., Delfiore, G., Degueldre, C., Luxen, A., & Franck, G., 1996) to understand the brain state association with REM sleep in humans, reported that subjects who were able to maintain stable REM sleep while the brain scan, could recollect dreams upon awakening. The study stated that there was a positive correlation between regional cerebral blood flow and REM sleep in the left thalamus, pontine tegmentum, anterior cingulate cortex, both amygdaloid complexes, and right parietal operculum; while there was a negative correlation between the regional cerebral blood flow and REM sleep.

The amygdaloid complexes play a crucial role in the procurement of emotionally influenced memories, hence the cortical areas and the pattern of initiation of the amygdala produce a biological basis for different types of memory procession during REM sleep.

Through various experimental studies, a passage link between dreams and REM sleep has been formed (Hobson, 1988). Initially, it was known that individuals who were woken up from REM sleep in opposition to NREM sleep depicted a higher number of dream reports which were more vivid and detailed. Evidence shows that dreams appear in REM sleep when the mechanism of REM sleeps breaks down. Throughout the REM sleep, signals that evoke motor output except eye movements are inhibited actively. Humans and other species might act out while dreaming in sleep which can damage the inhibitory response if there exists disorders or lesions naturally occurring in them (Sforza, Krieger, Petiau, 1997).

The essence of the dream-state is greatly subjective and a very intimate experience which makes the scientific analysis somewhat difficult to go about (Rachman, S., 1977). Dreams seem to constitute content that might seem nonsensical and not rational enough for interpretation, which makes the features of dreams from an objective point of view a confusing job. Although we all dream, there is a subjective difference between the experiences in all of our dreams (Hall and Van de Castle, 1966; Spadafora and Hunt, 1990). Some of us less frequently remember our dreams, which we conclude as not dreaming at all whereas others encounter detailed and vivid dreams with intense emotional content and imagery.

According to Revonsuo (2000), the threat stimulation system would be emerged in a surrounding influenced by the existence of crucial physical threats and naïve humans hence dream about realistic threat dreams that prepared their control of frightening physical surroundings. Since the time of evolution, humans rehearsed to respond to numerous threats with behavioral actions and this might explain why the reactions of the dreaming individual are mostly about running and fighting. In our contemporary society, most of the threats are emotional and psychological in nature. The threat that we face is very real but dissimilar to what was originally feared by early humans therefore the threat stimulation system gets activated but sometimes misses the mark.

Especially, it lacked in its chance to produce threats which are relevant in warming up the individual to come face to face with the real threats that await them in their wake life. Nevertheless, the threat stimulation system obtains its goal indirectly by motivating individuals to develop behaviors if the ones in their dreams fall short to help them escape threatening happenings. Dreams reflect significant psychological dissimilarities, portray responsiveness to psychological impacts and illustrate a structured relationship to waking thought (Domhoff, 1996; Kramer, 1982) which due to its repetition, the recurring dreams will be meaningful because dreams are perceived as a significant psychological product of the mind. These oneiric representations as in most dreams are often organized through the utilization of conceptual metaphors (e.g., Lakoff, 1993). In agreement with the continuity hypothesis which states that the minimal act of reflecting on the threats experienced in an individual's dream can be important in waking life rather than conquering such threats while sleeping because the content of the individual's daily dreams reflect one's waking states and affair (Domhoff, 1996).

For example, a piece of study evidence suggested that when former tobacco or alcohol dependent people dream about relapse, it can have a positive impact to preserve sobriety (Choi, 1973; Hajek & Belcher, 1991; Shafton, 1995). These particular dreams constitute intense emotions of regret, guilt, or panic and are followed by feelings of ease upon awakening. The study also states that the relationship between substance abuse and the displeasing dream experience may depict a structure of aversive conditioning and its impact intensified by a contemplated cognitive link between the unappealing behavior and its emotional impact. Dement (1974) a front runner of REM research, writes that he stopped smoking because of the dream of "an ominous shadow in my chest X-ray," later a physical examination which confirmed, “widespread metabases,” and “the incredible anguish of knowing my life was soon to end…” (Zadra, A., Desjardins, S., & Marcotte, E. (2006).

It is crucial not to overlook the fact that dreaming does not always have a function. Hunt (1989) states in a study that we may not find a fundamental use of dreaming any more than for the basis for human existence in general. The human mind which is a self-transforming, self-referential system can evolve its functions and express them creatively just like it did with other structures. (p.76). Therefore, during our evolution, aspects such as linguistic acquisition and the ability to comprehend meanings of symbols in association with a rise in emotions in opposition to physical threats might have conferred to modifying the how and why of our dream content. Various types of dreams could mean different predictions which come from the threat simulation theory. For example, the dreams that unfold the most threats are the nightmares whereas dreams of flying or having lucid dreams are less likely to present threats. A study was conducted under this view, where 175 nightmare reports from 118 adults disclosed that there was higher support for the threat stimulation postulation rather than the analysis of recurring dreams i.e., a greater percentage of threats experienced in nightmares are likely to appear in the dreaming individual’s life. This study is in agreement with Revonsuo’s (2000) proposition that the threats experienced in waking to provide the initiation of the threat simulation system. Nightmares are likely to be experienced when such threats are intense rather than recurring dreams or lucid dreams.

A study was conducted by Revonsuo (2000) that aimed to test the threat stimulation theory using a sample of 212 recurring dreams which was scored on the Dream threat rating scale. The study found that 66% of the recurrent dream reports embodiment of one or more threats, which were deemed to be dangerous and the individual took defensive or evasive measures which were reasonable in nature. Although, less than 15% of the dreams portrayed practical and realistic situations important for the individual’s survival or generative success, and the individual less than likely was able to confront the threat. Hence, the findings of this study provide a mix of results for the threat simulation theory. Some types of dreams reflect a malfunction in the dream state. Kramer (1991, 1993) argues that the psychological encounters of dreaming which accompanies REM sleep seem unable to suppress the emotional rush since the nightmares stand for a breakdown in the mood regulatory function of dreams. It is said to be true that most recurrent dreams constitute one or more threats and might permit the individual to go through the perception of a vast range of threats, even if not wholly efficient in avoidance responses. With that being said, when threats with great risks are perceived in recurring dreams, they most often do not permit the individual the capability to assess practical and realistic threatening events or to avoid them. The findings from the study (Revonsuo, 2000) support the statement of recurrent dreams: (a) Instead of accumulating successes of the dreamer’s attempt to fight or flee, the dream cumulate failures, (b)The exhausting efforts by the dreamers do not have any effect of the reduction of the probability of threats having displeasing consequences, (c) Instead of being placed in real-life situations or human ancestral situations by the dream production mechanism, the dream self places the dreamer in a peculiar and surreal environment, (d) Even though the chances of being exposed to the dream threats are rare, it is still impossible for the individual to come up with a measure against the frightening threat.

Neural Correlation between Changes in consciousness and Phenomenon of Dreams

Pace-Schott (2010) presents dreaming as not a very precise simulacrum which is considered as a display of replication of waking results that are different from waking consciousness, the former which is from neurobiological processes. The diverse brain activity that takes place during REM sleep can portray general characteristics and variations of dreams taking place during different phases of sleep (Desseilles et al, 2011).

Change in Consciousness

Though during REM sleep, the individual is asleep, they believe that is awake, as a result of constant inactivation of parietal and frontal circuits that are important for waking memory, insight, and self-awareness. If in the dorsolateral prefrontal cortex(DLPFC), there is a decrease in the metabolic activity, then during the REM sleep there will be a reduction in the characteristics of secondary consciousness. Only when DLPFC turns active again during the duration of lucid dreaming, the features of secondary consciousness will return (Voss et al, 2009; Hobson and Voss, 2010; Dresler et al, 2012). To explain why some facets of consciousness are readily available in REM and not NREM is due to the global disband of the amygdala, the pontine tegmentum, the anterior commissure, the parietal operculum, deep frontal white matter, and the mid-line thalamus in the NREM sleep in comparison with awakening and their succeeding reactivation during the REM sleep (Maquet et al, 1996; Braun et al, 1997; Nofzinger et al, 1997). The localized changes that take place in the parietal-occipital region, disregarding activities in the rest of the cortex, may contain an indication of conscious episodes in sleep (Siclari et al, 2017). The brain areas that encompass self-reflective thought and perform volitional capabilities are mainly overlapped with the neural correlations of lucid dreams (Voss et al, 2009; Hobson and Voss, 2010; Dresler et al, 2014).

Phenomenology of Dreams

As the perceptual equivalence principle states (Finke, 1989), common neural substrates exist for imagery and perception. The visual experiences that are presented by the brain activity patterns in stimulus perception (Horikawa et al, 2013) are similar to the episodes of visual encounters during the sleep onset stage, and also the activation in visual-occipital and auditory-temporal cortices that takes place in REM sleep is central to the visual and auditory elements delineated after waking from REM sleep (Braun et al, 1997)

According to the principle of perceptual equivalence (Finke,1989), there are common neural substrates for perception and imagery. Few of the visual experiences which occur in the sleep outset phase are similar to the visual experience that occurs during stimulus perception which is denoted by brain activity patterns. (Horikawa et al., 2013), and initiation in visual-occipital and auditory-temporal cortices in the REM sleep phase may be key to the visual and auditory elements that are very often reported after waking from REM state sleep (Braun et al., 1997). The study by Solms (1997) stated that there was a cessation of visual dream imagery in clients with extrastriate occipitotemporal lesions. Various reports of studies also tell us that many other behaviors share comparable neural correlations throughout wakefulness and dreaming (Erlacher and Schredl, 2008; Siclari et al, 2017)For example, the hand movements that are activated by the motor cortex during wakefulness is the same cortex to produce movements of hand during dreams (Dresler et al, 2011). We can say that the dreaming phenomenon in REM sleep is more varied than NREM sleep as the subcortical and neocortical forms of the brain are active during waking and REM sleep but inactive during NREM sleep (Hobson, 2009). For example, the mechanism controlling the sensory vividness of imagery is exhibited during REM while suppressed in NREM sleep and waking emotional processes that are exhibited in REM sleep and suppressed in NREM sleep (Carr and Nielsen, 2015).

Threat to Fear

We sleep so that we can function properly in our wake life, but is there a necessity to dream or a better question would be why do we even have dreams? (Muzet, 2007). Some of us believe that we don't dream, hence its absence wouldn't be fatal, although various studies say that dreaming can satisfy important needs (Lara-Carrasco, Nielson, Solomonova, Levrier & Popova, 2009). Even though most of us spend a good amount of our time dreaming, by some it is considered meaningless (Schredl & Montasser, 1996). There exists many diverse theories on why do we dream (Freud, 1900; Domhoff, 2001; Lansky, 2003; Schredl & Hoffman, 2003; Valli et al, 2005; Zadra, Desjardins & Marcotte, 2006; Levin, Lantz, Firemen & Spendlove, 2009; Desseilles, Dang-Vu, Sterpenich & Schwartz, 2011; Forrer, 2016; Hopkins, 2016; Schadlich, Erlacher & Schredl, 2016). One of the many possibilities is that dreams guard our sleep, as sleeping helps us to function. Guenole et al. (2013, p.1) state that- "According to the classic theory framed by Sigmund Freud, the basic…function of dreaming is to protect sleep from disruption…" to which Guenole et al. (2013, p.1) debated, "This aspect of Freud's dream model…leads to two empirically testable conjectures,..thus allowing its scientific examination: (1) arousal during sleep triggers dreaming; and (2) non-dreaming causes sleep disruption". Guenole et al. (2013, p.2) end his statement by saying that "Freud's theory of the basic functioning of dreaming" "is corroborated..". For instance, the higher Dream Recall Frequency (suggesting more dreams) found in clients with OCD or panic disorders (Schredl, 2001; Reimann, D., Spiegelhalder, K., Feige, B., Voderholzer, U., Berger, M., Perlis, M., & Nissen, C. (2010) defends the conjecture that sleep is triggered when aroused- which means that "neurotic" clients have less satisfied "drive demands" which protects the individual from the higher number of arousals due to dream that would result otherwise (Guenole et al. 2013, pp.1-2).

Now that we know, how dreams can trigger threats and prepare us for dangers and risks in our waking life, we should now move on to take a look at what and whom are we evolved to fear. For us humans, the etiology and usefulness of fear can be simple or complex, or both. It aids as a protective defensive mechanism against beings and/or situations considered as threatening or dangerous (Craske, Hermans & Vansteenweegen, 2006). It gets complicated when we have to elaborate on the existence and intensity of different types of fears and phobias. Why do we humans perceive snakes or spiders, wide open or closed spaces, thunder or lightning, or heights to pose a frightening threat to us rather than cars or guns? Seligman proposed that there is a distinct learning mechanism (evolutionary prepared learning) that reflects on the stimuli which worked as an appropriate response to the survival threats that were posed to our distant ancestors. In 1970, Seligman coined the term, "preparedness" to propose that a being is made ready by the evolution of its species, more or less by the conditional stimulus with the unconditional stimulus or a response given with an outcome.

Threat stimulation in Virtual Limbo

An alliance between video game studies and the theory of evolution can elaborate on the psychological functions and features of horror video games. The players can stimulate their game with fear scenarios of uncertainty and dangerous risks. These prototypical situations help to improve their survival instincts and assess dangers. Although, while playing horror games the individual might perceive intense negative emotions but they entice them with challenges with stimulation for fear coping. The individual players who pass these put forth challenges broaden their emotional and behavioral skills and learn a sense of mastery, describing the genre's puzzling appeal.

Threat Assessment

Individuals who do feel threatened are inspired to assess the risk to either prepare for it or to avoid it fully (Barrett, 2005; Woody and Szechtman, 2011). The players do so by carefully scanning their surroundings for any signs of danger such as malicious conspecifics may be talking loudly or scaring the wildlife nearby by giving away their location. There is a chance for false positives as the organism might be in a state of heightened psychophysiological receptivity, allowing it to immediately identify or misidentify a forthcoming threat. It is better to expect the worse and the result for inaction could be fatal, it is necessary to mark potential threats; better safe than sorry(Barrett, 2005; Haselton and Buss, 2000) The threat assessment appears to be present widely in horror games such as Silent Hills 2 (Konami, 2001) and Amnesia: The Dark Descent (Frictional Games, 2001) The individuals playing this game can investigate various frightening settings to search for malicious forces that may present themselves as potential threats. In the horror-adventure game Tormentum- Dark Sorrow (OhNoo Studio, 2015) which is a point-and-click game, the player has to navigate an environment of Gigeresque which manifests great danger and uncertainty. The game constitutes various puzzle solving and discovery of the fantasy world, putting a premium on sensory acuity.

Threat negotiation

Threat negotiation tells us that not every threat can be dealt with with information and foresight. Some encounters must be fought or fleed away from, the same way we do in real life. Our fear system is built appropriately for such contingency and aids us to copeThe human fear system is prepared for this contingency and rapidly prepares the organism to cope with the fear (Lang et al.; 2000; Marks and Nesse, 1994; Ohman and Mineka, 2001)
Clasen (2017:26) summarizes the intensity of the emotions by stating how the rate of the heartbeats increases and glucose shoots into the bloodstream for a sudden energy fix. Then the blood is made to be diverted from the digestive system to the large groups of muscles. Therefore, attention is fully focused on the potential threat. An automatic force prepares the player for the situations that might pose danger with aggressive actions or in some very rare scenarios, tonic immobility to a solid and instant threat. In horror games, if the player can deal with stimulated threats it is because of the dynamic threat negotiation, learned by the player. We can take the example of the adrenaline-pumped chase sequences in Outlast (Red Barrels, 2013). There is a perfect division of paradigmatic threat assessment of stealthy exploration and threat negotiation of chase sequences in the gameplay. Several theorists of this particular genre agree that horror video games have two modes or intensities of gameplay, towards which different games assign different weightings (Nacke et al., 2016; Perron, 2005; Toprac and Abdel-Meguid, 2011). Threat assessment is highlighted by survival horror games, which means that these particular games are about venturing into dangerous scenarios while avoiding any potential risks and it is also about broadening an air of vulnerability and anxiety that pushed the individual playing to stay alert.

The appeal of threat stimulation on Clasen's adaptationist perspective on horror shows us that horror video games provide a safe experience while tackling prototypical scary scenarios. We humans as social, roaming species as faced several dangers on our path to survival since the dawn of time, due to our proper fear system. Humans have shared these experiences as tales and fables for millennia and through these stories, (Clasen, 2017; Sugiyama, 2001) we are subconsciously gathering information about avoidance and survival relevant information and stick it in our memory, as studied on adaptive cognitive biases (Niarne and Pandeirada, 2016) The contemporary horror video games provides an intimate experience with our Self. The game lets the individual playing choose the type of stimulated danger they want to encounter and practice effective coping.

Fear stimulation in Horror Movies

Horror movies aim to bring up our unconscious fears, thoughts, and desires of the primitive id that is lays buried deep in our collective unconscious. Sigmund Freud, mentions that horror emerges from "uncanny" images and thoughts in our Id. A cultural historian, D.J Skal, describes that in the movies in this genre, horror can be a reflection of our societal fears. He explains further in his book, The Monster Show, how horror entertainment can be linked with the current social crisis in our time. Horror entertainment has become an outlet to project our social anxieties and space to get away from societal failures.

As humans we have innate fears and learned fears, certain things scare us involuntarily, like snakes because it is part of our primary instincts, the filmmakers take advantage of this fear and use monstrous-looking animals in the movies to feed our fear and stimulate it more. By studying the brain activities and physiological response, we can further reveal what happens to our body while watching a horror film and evokes certain emotions. With the use of eerie music, camera angles, and violent scenes, the filmmakers heighten our adrenaline and we are rushed by fear of anticipation and excitement all together. Physiologically, our blood pressure increases, with our heart rate and our respiration, and only after the end of the movie does that tension release. Our reaction to what we watch on the screen does not just affect our brains but we can see its effect throughout our body. When the brain signals an alarm for the autonomic nervous system to activate, it produces cortisol and adrenaline and two neurotransmitters also causes changes in the body at the physiological level. As the audience we know that we are watching the movie in a safe environment hence, not dealing with that particular threat in real life. Concordia University-Saint Paul conducted a study that states, how horror entertainment can trigger our fight or flee response which occurs due to an increase in adrenaline, dopamine, and endorphins while watching the movie from a safe place. The brain can analyze our surroundings and conclude that there is no potential threat around us. Margee Kerr, a sociologist while talking to The Atlantic states that there is an increase in breathing, muscle tension, and various other non-voluntary responses when the physical recoil interrelated with fear wears off and is then replaced with relief of high intensity. In a very small period, the brain is flooded by feel-good chemicals and positive feelings are intensified.

In an article by Abigail Marsh, she explains how fear can trigger a signal in the brain. She describes by saying that, the brain signal moves to the amygdala. There the amygdala fires up a chemical of the brain known as glutamate onto two areas of the brain. The first area compels us to involuntarily jump or freeze. The reactions are very automatic as these brain signals are sent deep into the base of our brain and we have little control over it. The second area that gets activated is the hypothalamus, where our fight or flight response is triggered, it is when our body goes into superhuman mode. This activation increases our blood pressure and heart rate and pumps adrenaline through the entire body. Hence, that's the rush we feel when scared (2013). Therefore, we see how horror movies evoke psychological emotions and affect our minds and behavior.

Postoperative Hemorrhage: the Physiological Effect of Fear in Dreams

It is a piece of common knowledge now that the frightful thoughts and ideas that we have might have troubling effects on our bodies. In the same way, we are aware of how bad dreams and night terrors can produce disturbing bodily behavior. Little known but increasingly recognized is the factor played in hemorrhage states by character traits, personality structure, emotional factors, and stresses (Cheeke, 1963). However they may be originated, the fearful thoughts and stressful emotional states are formidable forces that play a role in physiological functioning which are not easily mitigated by the processes of reasoning. Further, the mitigation of disruptive emotions and thoughts is even less likely when they are in association with frightful dreams and therefore there can be actual physical harm taking place from the conceived dream.

CONCLUSION

As mentioned before, fear can be innate or learned which helps us to steer clear from any potential dangers. The threat simulation theory explains how the role of dreams is to prepare for threatening situations, which aided advantageous for our ancestors for their survival. I recall something I read about dreams, that one should know the meaning of the dreams. Dreams can teach us about waking, dreams reflect reality. Nothing ever happens in the waking world until it happens in the dream world. In the dream state an individual can act out their inner desires which they can’t in a waking state. Carl Jung (1968) believed that dreams served us two purposes; firstly, to compensate for the disparity in the individual’s psyche and secondly to provide probable images of the future, which permitted the individual to predict future events. Recent studies in neuroscience have theorized that emotions evoked while in the dream state can be a contributing factor to the resolute of emotional distress and future affective responses. The study explains how the experience in dreams can be associated with responses to threatening signals in wakefulness. In a study (Sterpenich, V., Perogamvros, L., Tononi, G & Schwartz, S, 2020), serial awakenings were recorded in 18 participants all night with high-density electroencephalography (EEG) and were asked if they encountered any fear in their dreams. There was an increase in the activity of the Insula and mid-cingulate cortex who dreams that contained fear. Another study, related to the first was conducted where it was found that the participants who showed higher content of fear in the dreams had less emotional arousal and reduced fMRI response to the fear stimulating stimuli in the amygdale, Insula, and mid-cingulate cortex during wakefulness. These findings from the study validate the emotions evoked in dreams and wakefulness utilize similar neural substrates and form an association link between the emotional happenings during sleep and emotional brain activity during wakefulness. Therefore, individuals whose dreams had a high content of fear-related emotions showed strong fear inhibition when awake. At present, we have a wide knowledge of how does fear functions in our dreams and prepares us for potential threats. We are aware of the virtual stimulation of threat and fear and their role in aiding safe space to learn to cope with dangers. Dreams trigger threats and prepare us for dangers and risks in our waking life. the threat stimulation system obtains its goal indirectly by motivating individuals to develop behaviors if the ones in their dreams fall short to help them escape threatening happenings. Dreams reflect significant psychological dissimilarities, portray responsiveness to psychological impacts and illustrate a structured relationship to waking thought. The question that remains unsolved is why in the threat stimulation theory of dream function, constituting realistic and unrealistic (but anticipated) threat perceptions and avoidance responses not present in most recurring dreams?

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Acknowledgement

I would like to thank my supervisors, Ms. Nikita Srivastava and Ms. Manjari Sarathe, for their unwavering support, patience, encouragement, passion, and immense knowledge. Their expertise was paramount in generating a structure for the paper as well as identifying the key research techniques undertaken in the paper. Without their help, the final product would have been extremely lacking.

Conflict of Interest

The author(s) declared no conflict of interest.

How to cite this article: Varghese S. (2021). The Evolution of Fear in Wakefulness and Dreams. *International Journal of Indian Psychology*, *9*(3), 2295-2314. DIP:18.01.219.20210903, DOI:10.25215/0903.219