Theories of why humans sleep

Siegel (2005) simply stated that “ the functions of mammalian sleep are unclear”. One could simply answer; “ because we’re tired” or “ to relieve tiredness”, but that of course does not answer the inherent question no more than explaining why do we get hungry or thirsty by saying we eat because we’re hungry or drink because we’re thirsty. Organisms do their best to regulate eating, drinking, breathing and sleeping, functions critical to their health and well-being thus suggesting that sleep plays an important role in those areas. However although we may feel better, more alert, energetic, even happier after a good night’s sleep; the fact that we do and that we would feel a whole lot worse without having that sleep only touches on the reasons organisms need to sleep.

There are comparisons between, for instance the need to sleep and the need to eat. Ultimately both are life-sustaining but on a more basic level we see that a lack of food causes hunger and leads to a desire to eat and a lack of sleep causes tiredness leading to a desire to sleep. So both eating and sleeping are regulated by strong internal drives. We know that eating provides the nutrients that an organism needs to sustain its body; but what does sleep do for an organism, other than relieve tiredness?

That is a question to which the answer has remained somewhat elusive. Scientists have tried to answer this question, taking them down numerous paths but none leading to a definitive conclusion. They have studied humans and animals that have been sleep deprived, they have looked at sleep patterns of numerous organisms to look for similarities and differences between species to see if that would throw any light upon the function of sleep. Yet after decades of research the questions as to why organisms sleep

remains difficult to answer. All this research has led to a number of theories regarding the function of sleep. We shall consider four of those theories in this discussion; the inactivity theory, the energy conservation theory, the restorative theory and the brain plasticity theory.

Inactivity theory is sometimes called the adaptive or evolutionary theory as it puts forth that the inherent inactivity during sleep is an adaption bought about as a survival function as it would serve as a protection at night suggesting that those how were able to remain still and quite had an advantage over those that remained active those avoiding predators that favoured the dark with their better eyesight and avoiding accidents caused by not seeing so well in the dark. Through natural selection inactivity theorists conjecture that what we now called sleep evolved. An objection to this theory is the advantage of staying in a conscious non-sleep state to enable the requisite reaction needed to any possible attack or danger. So although it could be said that staying still and quite would be advantageous it cannot legitimately be said that being in an unconscious state would garner the same results.

Energy conservation theory is linked again to the argument of natural selection for as mentioned earlier an organism’s need for food and water, along with sleep, is of paramount importance. There was a time when there wasn’t a supermarket on every corner and competition for limited resources was rife. As such energy conservation theorists argue that the primary function of sleep would be to reduce the organism’s rate of energy depletion by minimising its needs during parts of the day, particularly as during the night, for humans at least, it would be more difficult to search for food.

Evidence from research showing that the human metabolism reduces by up to 10% during periods of sleep, along with the lowering of body temperature and the reduction of calorific demand would lend support to the theory that one of the primary functions of sleep for any organism would be to conserve limited energy resources as such many scientists link this theory to the inactivity theory already discussed.

Next, the restorative theory; it has been a widely accepted belief that sleep restores our body whilst sleeping thus enabling us to live another day amidst whatever stressors and dangers that await us. Many studies on humans and animals have given us empirical evidence supporting this hypothesis. With some poor rats subjected to sleep deprivation causing them to lose their immune function and die within a few weeks (Everson, Bergmann, & Rechtschaffen, 1989). There have been numerous findings detailing the beneficial restorative functions that sleep induces on our bodies such as muscle growth, tissue repair and protein synthesis. One such study undertaken at the University of Chicago limited the sleep of eleven young men to four hours of sleep each day for six days. It was reported that after that period their bodies' cells were performing like those of 60 year olds and that the level of their insulin was similar to someone with diabetes (Spiegel, Leproult, & Van Cauter, 1999).

Our brains although very active during sleep also undergo regeneration. Adenosine is produced by neurons in the brain whilst we are awake a build-up of which is said to be one of the reasons we feel tired (Porkka-Heiskanen, 1997). Although the effects of adenosine can be lessened by stimulants such as caffeine which serve to block its effects it is found that sleep clears

adenosine from the body. In addition research conducted on mice has shown that during sleep the brain goes through a cleansing process whereby harmful toxins and proteins that build up between brain cells are washed away with cerebrospinal fluid; the flow of which increases dramatically during sleep (Xie et al., 2013).

Brain plasticity theory postulated more recently derives from the findings that the brain under-goes changes to its organisation and structure during sleep. Although not yet entirely understood it is becoming evident that sleep plays a crucial role in learning and consolidating memories (Maquet, 2005). It is now clear that sleep plays a very important role in the brain development of young children with infants spending up to 15 hours a day sleeping (Hirshkowitz et al., 2015) with much of that consisting of REM sleep (Denenberg, & Thoman, 1981). Even in adults brain plasticity and sleep is linked, this is becoming clearer as the effects of sleep deprivation on learning and the performance of a variety of tasks is studied (Dang-Vu, Desseilles, Peigneux, & Maquet, 2006).

Being theories, none of the above-mentioned explanations as to why organisms sleep are proven; yet science continues to advance as it seeks to understand what is going on when organisms sleep and what mechanisms within a body are at work to control the various known sleep cycles. Therefore, in conclusion it could be said that we currently cannot answer the question “ Why do organisms sleep”? We can only put forth theories and look for further evidence for and against them.