

## From the Field:

### Boy, Am I Tired!! Sleep....Why you need it!

By Dr. Chrystyne Olivieri, DNP

#### History of Sleep

Psychiatrist Thomas Wehr studied sleep from the late 1970's through the 1990's. He performed sleep studies to determine a normal human sleep pattern. He discovered that when participants were subjected to 14 hours of darkness in each 24 hour period for over a month, a natural sleep pattern emerged. It consisted of sleeping for four hours, then wakefulness for one to two hours. Then subjects fell back into another four hours of sleep (Wehr, 1992).

This was supported by anthropologist and historian Roger Ekirch in 2001. After more than a decade of sleep research into old and ancient writings, he discovered over 500 references of historical evidence that humans naturally sleep in two distinct cycles, separated by about two hours of mid-night wakefulness (Ekirch, 2015). Despite this evidence, most people continue to believe in the idea that we must sleep for eight continuous hours for optimal health.

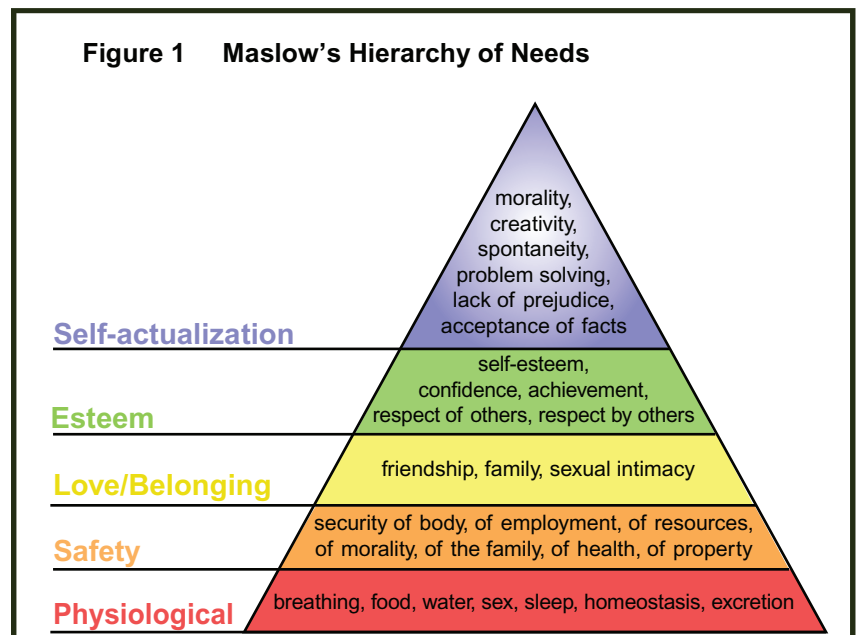
Ekirch found that these historical references stated that during mid-night wakeful periods, people would rise to a fully awake state. They would eat, smoke, read, go to the toilet, pray and have sex. Some of the references would even suggest that this mid-night wakeful period was the best time to have sex to encourage conception. These references to a bi-phasic sleep pattern became less common approaching the late 17th century. Ekirch attributes this shift to improvements in lighting, both indoor and outdoor as well as to coffee.

Since the Industrial Revolution and the widespread use of artificial light, more people became adapted to the eight-hour sleep cycle. However Ekirch believes this may be the basis for many common sleep problems which are rooted in the human body's natural preference for the biphasic sleep cycle. Perhaps waking up during the middle of the night is a normal part of human physiology.

This was the conclusion made by sleep psychologist Gregg Jacobs. He evaluated sleep cycles in those with "insomnia". He believes that human beings slept a certain way for most of human evolution for a reason. Waking during the night should be considered normal. However, the commonly held belief that night time wakefulness is indicative of insomnia, requiring pharmacological interventions is often anxiety provoking for those in modern civilized cultures. It is this very anxiety which will cause more anxiety for future sleep eventually affecting daytime wakefulness (Jacobs et al., 1993).

#### Physiology of Sleep

Sleep is essential to a healthy human being. It is among the basic necessities of life, located at the bottom of Maslow's Hierarchy of Needs (**Figure 1**). It is a dynamic activity, necessary to maintain mood, memory and cognitive performance. It plays an important role in normal endocrine and immune function. Recent studies are finding a growing link between sleep disorders and obesity, diabetes, hypertension and depression (Irwin, 2015).



Sleep disorders are strongly associated with the development of acute and chronic medical conditions. Everything from asthma and arthritis to cardiovascular disease and diabetes (Smolensky, Di Milia, Ohayon, & Philip, 2011). When adequate sleep is not achieved on a regular basis, bad things happen. Poor sleep has been linked to daytime drowsiness causing 846 auto fatalities in 2014. Between 2005 and 2009, there were about 83,000 auto crashes each year related to drowsy driving (National Highway Traffic Administration).

In May 2013, the U.S. Food and Drug Administration has issued a warning about impaired driving the day after using Ambien CR, a common narcotic prescription sleeping pill both 6.25mg and 12.5mg dosing. This report also included dosing recommendations that 5mg for women should be the maximum as impaired driving and increased auto accidents are more likely with higher dosing.

Sleep is such a misunderstood health issue that it is rarely a topic discussed during a medical office visit. That is unfortunate because it is estimated that 50-70 million Americans report having some form of sleep disorder (Centers for Disease Control and Prevention). The loss of sleep is considered to be cumulative with a sleep debt that must be repaid. Human circadian rhythms refers to the cyclic fluctuations in body temperature, hormone levels and sleep which occur over 24 hours. These internal rhythms in physiology and behavior are imbedded within our physical environment and our work/social schedules. Exposure to light is one of the most profound rhythms which help induce sleep and wakefulness and is hardwired within human physiology. Melatonin, a brain hormone linked to sleep and wakefulness, is released or reabsorbed in response to light (Ferracioli-Oda, Qawasmi, & Bloch, 2013). Sleep disorders occur when our natural circadian rhythms are disrupted, such as with jet lag and shift work (Martinez & do Carmo Sfreddo Lenz, 2010). This will likely disrupt our physical performance and mental acuity.

There are two main types of sleep: REM (Rapid Eye Movement) sleep and NREM (Non-REM) sleep. These stages are measured using an electroencephalogram (EEG). Non-REM sleep consists of four stages:

Stage I: Drowsiness or the transition from being awake to falling asleep. All the physiological processes slow down. Brain and muscles function slows, twitching may occur.

Stage II: Light sleep when eye movements stop. Brain function becomes slower and muscles become more relaxed. Heart rate slows and body temperature decreases.

Stage III and IV: This is a deeper stage of sleep with slower brain waves, lower blood pressure and body temperature. Hormones are released such as growth hormone, essential for tissue growth and repair. The body becomes immobile. This slow wave sleep makes arousal

most difficult. Being awakened during this stage may cause one to be disoriented for several minutes.

REM sleep is a much more active period of sleep with intense brain waves. Breathing may be rapid, irregular or shallow and eyes move rapidly. Limb muscles are basically paralyzed. This is also the stage where dreams occur (National Sleep Foundation).

### **Sleep and Aging**

It is important to have a balance of both types of sleep to achieve a restful and restorative sleep. Although sleep quality does become more fragile as we age, our need for sleep does not diminish. Some of the factors which can interfere with sleep as we age include physical and mental health problems, polypharmacy, functional status, primary sleep disorders and changes in circadian sleep-wake patterns. Lifestyle regularity is one of the best ways to ensure a lifetime of good sleep. The maintenance of routine behaviors as we age has been found to be associated with fewer sleep problems. Decreased light exposure signaling melatonin release is one of the most powerful factors associated with sleep onset and quality. Aging may change natural circadian rhythms which make routine behaviors even more important to preserve natural, restorative sleep cycles (Zisberg, Gur-Yaish, & Shochat, 2010).

Menopause is also associated with the onset of sleep disturbances for women. Menopause is also a time of life associated with vasomotor hot flashes, anxiety and depressive disorders (Joffe, Massler, & Sharkey, 2010). Night-time hot flashes disrupt the thermoregulation system which is tightly associated with sleep. It is primarily the hormonal fluctuations, particularly of estradiol, follicle-stimulating hormone, progesterone and testosterone which affect the sleep quality. In many cases, the use of hormone replacement can solve the problem (Ameratunga, Goldin, & Hickey, 2012).

Another primary sleep disorder is obstructive sleep apnea (OSA). This is more common with aging and can contribute to sleep problems. It is highly associated with overweight and obese men and women, however it can occur in those that are not significantly overweight. It is also associated with snoring. Sleep apnea occurs when the airway collapses due to loss of muscle tone of the pharyngeal airway causing temporary interruptions in breathing. Anyone can snore, but not all who snore have sleep apnea. Sleep apnea causes intermittent hypoxia (reduced oxygenation in the blood) and often leads to weight gain, insulin resistance and diabetes (Pamidi, Aronsohn, & Tasali, 2010). It also leads to hypertension, cardiovascular disease, heart attack and stroke (Gottlieb et al., 2010). Many with sleep apnea have chronic daytime sleepiness related to poor nighttime sleep quality.

Weight loss is very helpful to relieve the severity of OSA, however it is not curative. Prevention of weight gain is always easier than treatment of the obesity related diseases. The most effective treatment is continuous positive airway

pressure or CPAP (Dempsey, Veasey, Morgan, & O'Donnell, 2010). Using CPAP every night provides a mild air pressure to keep the airway open with every breath. It also has been shown to reduce the risk of developing cardiovascular diseases (Martínez-García et al., 2012). This must be prescribed by a medical doctor or nurse practitioner and is usually only prescribed after doing a sleep study test to determine severity of OSA.

### Sleep and Children

Obesity even in children is a factor that influences sleep. Obese children have been found to have more disrupted sleep patterns. This is associated with altered insulin sensitivity, inflammation and oxidation of low-density lipoprotein: all metabolic risk factors for diabetes and cardiovascular disease. Those children who sleep less hours due to later bedtimes or busy schedules exhibited the greatest risk (Spruyt, Molfese, & Gozal, 2011).

Sleep cycles have been studied in all age groups of children. Research has found that there are many biologically based sleep regulatory changes that occur specifically during adolescence. During puberty, sleep-wake cycles can be delayed by as much as two hours. They are associated with a delay in evening melatonin secretion and a profound shift in circadian rhythms. This delay in sleep cycles can reduce total sleep time due to school and activity schedules. Often adolescents have difficulty falling asleep before 11pm with the ideal wake time around 8am (Owens, Belon, & Moss, 2010). A large number of studies have now documented that the average adolescent is chronically sleep deprived. It has been suggested that a modest 25 to 30 minute delay in school start time could have a significant impact in student performance through adolescence (Boergers, Gable, & Owens, 2014).

### Improving Sleep Quality

Sleep hygiene is the process of using routine behaviors to encourage restorative sleep and full daytime alertness. It is based in establishing a set of lifestyle patterns which will promote sleep naturally. This is based on human physiological needs throughout human evolution and our natural circadian rhythms. Sleep hygiene practices include:

- Avoid naps as this will disrupt normal sleep/wake cycles
- Avoid stimulating drugs like caffeine, nicotine and alcohol. Chocolate has caffeine. Although alcohol may initially induce sleepiness, as it metabolizes it will result in arousal
- Exercise daily - the human body was meant to be active and that activity will result in better sleep.

Reserve the most vigorous activities for early in the day and more relaxing exercise like yoga in the evening

- Avoid eating too close to bedtime - if possible, maintain several hours after your last meal or snack before you go to bed
- Encourage low light as you get close to bedtime. Nighttime light exposure discourages melatonin, the sleep hormone
- Establish a regular and relaxing bedtime routine. Try to go to bed the same time every night
- Try to keep your bedroom a nice place to sleep. Use soothing colors and relaxing patterns. Try not to use your bed to do anything but sleep and have sex. Keep the room not too hot or cold
- Remove technology from the bedside - keep cell phones in another room and remove any ambient light from other devices from view (National Sleep Foundation).

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