# Sleeping Disturbances

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Abstract

Since a large percent of a person's life is spent sleeping, it is crucial to achieve sufficient sleep. Sleeping disturbances are largely responsible for inadequate sleep. Sleep disturbances usually result from biochemical or environmental influences. Consequently, there are many harmful short-term and long-term effects on the body. In order to minimize harmful effects, bright light treatments, sleeping pills, cognitive behavioral therapy alterations, and other treatment may be beneficial. In order to sleep sufficiently and avoid sleeping disturbances, however, exercise, proper sleep hygiene, and other prevention methods can be taken.

## Sleeping Disturbances

Approximately one third of an individual's life is spent sleeping. In the average person, that is 25 years. Sleep is crucial in helping the mind and body to be renewed and refreshed (Searle, 2000). The typical individual needs about 7 or 8 hours of sleep a night. Sleep needs change, however, from one person to another. Therefore, the best method to assess adequate sleep is directly related to how energized a person feels throughout the day (Searle, 1995). Noland, Price, Dake, and Telljohann (2009, p. 225) defined sufficient sleep as being "the amount necessary to permit optimal daytime functioning." On the other hand, sleep deprivation is "the inability to get adequate amounts of sleep" (Searle, 1995, p. 2).

## Sleeping Disorders

The American Sleep Disorders Association categorized over 70 different types of sleeping disorders in 2000. Some of the more common disorders include insomnia, sleep apnea, narcolepsy, and restless leg syndrome (Searle, 2000). Next to common sleeping disorders, Delayed Sleep Syndrome and Advanced Sleep Syndrome affect the body's ability to feel sleepy when going to bed or awake when rising in the morning.

### Insomnia

One of the most frequently occurring sleeping disorders is insomnia. Approximately 1/3 of adults are faced with insomnia at some point during their lives (MayoClinic, 2009). Insomnia is defined as reduced sleep quality or difficulty initiating sleep and/or maintaining sleep, for a month or more (Randall, Roehrs, & Roth, 2008). Insomnia falls into two sub-groups: sleep-onset insomnia and sleep-maintenance insomnia. Sleep-onset insomnia impairs the ability for individuals to fall asleep

(Sleeping pills, 2008). Researchers have found that delayed melatonin rhythms and body temperatures correspond with sleep-onset insomnia (Lack & Wright, 2007). Sleep-maintenance insomnia affects an individual's ability to remain asleep through the night (Sleeping pills, 2008). It is estimated that 10-15% of adults will struggle with sleep-maintenance insomnia (Mayo Clinic, 2009).

Causes of insomnia often branch from a variety of other ailments. Stress, anxiety, depression, and caffeine, and a host of other causes are largely responsible for sleep-onset insomnia (Mayo Clinic, 2009). Despite the prevalence of insomnia in older individuals, it can affect individuals of all ages. A recent study of insomnia disorders experienced in specific occupations surveyed nurses working in the United States. Of 2,082 nurses, findings evidenced that 27% suffered from insomnia. Likewise, 32% experienced difficulty remaining asleep. As a result, loss of sleep correlated with a higher percentage of errors in the nurses' dispensing of prescriptions and their patients' chart records (Amschler &McKenzie, 2010).

**Sleep Apnea**

Sleep apnea is a sleeping disorder that is characterized by interrupted breathing (Searle, 1995). In most cases, the tongue, tonsils, and/or soft palate block the air from traveling in and out of the throat. Such cases usually result from built up fat tissues in the neck region caused from being overweight. However, a more serious form of sleep apnea called central sleep apnea occurs when the portion of the brain responsible for controlling respiration does not remember to instruct the chest muscles and diaphragm to initiate breathing (Sleep apnea: Keeping up the positive pressure, 2010).

**Narcolepsy**

Narcolepsy is another sleeping disorder where a person will become overly sleepy during the waking hours (Searle, 1995). It is characterized as a neurological disorder which results from the brain's inability to correctly regulate sleep and wake cycles. As a result, people suffering from narcolepsy will face random, irresistible bouts of sleep. When the urge to sleep becomes too great, a person will fall asleep for anywhere from a few seconds up to several minutes. In extreme cases, a person may fall asleep for an hour or more (National Institute of Neurological Disorders and Stroke, 2009).

Along with daytime sleep bouts, there are three other major symptoms that characterize narcolepsy. The first symptom that commonly occurs in conjunction with narcolepsy is cataplexy, which is an impulsive loss of voluntary muscle tone. The second symptom is vivid hallucinations that take place when falling asleep or immediately after waking in the morning. The third symptom is episodes of brief paralysis of the entire body either prior to falling asleep or immediately before waking up. It usually takes 10-15 years to diagnose a person with narcolepsy after identifying the first one of these symptoms.

Although research has produced many answers to questions about the biological process involved with narcolepsy, its cause remains unknown. Researchers suspect, however, that a combination of factors involving sleep disturbances and neurological dysfunction may be responsible for its cause (National Institute of Neurological Disorders and Stroke, 2009).

**Restless-leg Syndrome**

Unlike narcolepsy, researchers believe that restless-leg syndrome is highly under-diagnosed. Clinical diagnosis for restless-leg syndrome is determined by random,

irresistible urges to move the legs or arms and some occurrences of paraesthsia ("Improve symptoms of restless legs syndrome with dopaminergic agents and other treatment options", 2009). Both Restless-Leg Syndrome Foundation (2007) and the journal article "Improve symptoms of restless legs syndrome with dopaminergic agents and other treatment options" (2009) stated that symptoms will worsen when individuals are at rest, symptoms will improve when individuals are active, and symptoms will worsen as evening approaches and into the night. Irresistible leg movements in turn can cause difficulty in falling asleep or staying asleep (Restless-Leg Syndrome, 2007). Restless-leg syndrome in children is somewhat different than in adults. Therefore, it can many times be misdiagnosed as growing pains instead.

The cause of restless-leg syndrome is thought to be associated with iron deficiency. Researchers believe that symptoms resulting from the disorder are due to the brain's inability to control iron homeostasis. In patients with mild cases, hot baths are usually sufficient to help relax the muscles and decrease symptoms during sleep. In more severe cases, however, it is necessary to treat patients pharmaceutically ("Improve symptoms of restless leg syndrome with dopaminergic agents and other treatment options", 2009).

**Delayed Sleep Phase Syndrome**

Delayed Sleep Phase Syndrome (DSPS) is a circadian sleeping disorder that hinders the ability to fall asleep at night and causes problems for individuals to wake up at their desired time. Despite their trouble falling asleep and waking up, people with DSPS do not have difficulty sleeping through the night. Rather, their sleep cycle throughout the night tends to be normal. However, the result of sleep disturbance affects

daytime functioning and takes a toll on the body. Moreover, by sleeping in later on the weekends to recover from sleep debt, the circadian rhythm is further delayed and the effects of DSPS are greater on the body (Lack & Wright, 2007).

### Advanced Sleep Phase Syndrome

Advanced Sleep Phase Syndrome (ASPS) is a sleeping disorder that results from significant sleepiness occurring early in the evening and before normal waking hours in the morning (7-8am). Even when individuals with ASPS attempt to change their sleeping patterns and delay sleep, they still awaken earlier than desired, causing sleep debt. Many times temperature minimum will occur around 12 am, causing their wake time to occur as early as 4 am. Consequently, on any given night, individuals may only accrue between 5-6 hours of sleep a night (Lack & Wright, 2007).

### Content of this Literature Review

The term *sleep disorders* represents a wide variety of conditions. Sleep disturbances represent only one group of sleep disorders. Therefore, the scope of this literature review is limited to the causes of sleep disturbances, the effects of sleep disturbances, treatment methods, and prevention.

## Known Causes

The subject of sleep entails complex material. There is vast information yet to be discovered about sleep in general. Furthermore, the information researchers have gathered concerning sleep mechanisms, has illuminated some of the reasons sleep disturbances occur. Known causes of sleep disturbances can be connected to biochemical and/or environmental influences.

**Biochemical Causes**

In order to categorize sleep disturbances, it is imperative to understand the biochemical processes that cause them. Alterations in sufficiency of sleeping are controlled from deep beneath the skin. Three of the primary biochemical causes responsible for sleep loss involve melatonin, REM and non-REM cycles, and circadian rhythm.

**Melatonin causes.** Melatonin is a sleep related hormone that is secreted from the pineal gland. It is synthesized in the retina and corresponds with light and dark phases of sleep (Hardeland & Poeggeler, 2007). Its primary function is to transmit information received from the light/dark cycle to each tissue in the body (Lack & Wright, 2007).

There are two melatonin receptors found in the hypothalamic circadian pacemaker and the suprachiasmatic nucleus. They convey the position of darkness from the circadian rhythm phase to the oscillator system (Hardeland & Poeggeler, 2007). When the optic nerve processes light/dark photo-periodic information, it then delivers that information to the suprachiasmatic nucleus. After the suprachiasmatic nucleus (SCN) receives information from the optic never, it generates a 24 hour endogenous cycle that signals the brain to control other hormones that enhance or inhibit sleep (Lack & Wright, 2007). The SCN, when exposed to light, will instruct the body's temperature to increase and to inhibit the release of melatonin. Even when the pineal gland is turned on, it will not produce melatonin if bright light is present. On the other hand, when light is absent, body temperature will decrease and the onset of melatonin is initiated (National Sleep Foundation, 2009a).

Melatonin onset usually occurs approximately two hours before falling asleep. Lack and Wright (2009) studied the effects of melatonin secretions on sleep efficiency. The control group they studied consisted of individuals whose sleeping patterns matched that of the light and dark cycle (going to bed at approximately 11 pm and waking at around 8 am). Results of the study confirmed that melatonin onset occurs about 2 hours before sleep occurs, at 9 pm. In the average participant the largest amount of melatonin secretion was produced between 1-3:00 am. According to the National Sleep Foundation (2009a), melatonin levels in the blood remain elevated for about a 12 hour period of time. At around 9 am, melatonin levels decrease, and they are hardly measurable during the day.

**Circadian rhythm causes.** The propensity to fall asleep is uniquely linked to the circadian system (Lack & Wright, 2009). Circadian rhythm is many times referred to as a *biological clock*. Its purpose is to regulate the body's wakefulness and sleepiness. Throughout the day the circadian rhythm rises and falls. Although differences may occur, for most individuals, the strongest sleep drive takes place when the circadian rhythm falls between 2:00-4:00 am, and between 1:00-3:00 pm. Depending on how sufficient the preceding night's sleep was, a person will either feel more tired or less tired during the afternoon rhythm falls.

As stated before, the release of melatonin is controlled by cells in the brain that respond to light and dark signals called the Suprachiasmatic Nucleus (SCN). In the same way, the circadian rhythm receives its biological timing instructions from the signals from the SCN and consequently, melatonin (National Sleep Foundation, 2009b).

Because so many biological processes must agree in order to achieve sufficient sleep, small changes in circadian rhythm can produce a number of potential problems. Godfrey (2009) found that circadian rhythm alterations are usually the cause of sleep disorders. Furthermore, common circadian rhythm disruptions such as jet lag and shift work may highly disturb an individual's normal sleeping cycle. Jet lag results from an upset in circadian rhythm from traveling across many time zones at fast speeds. It is usually present when 3 or more time zones have been crossed. Interestingly, the circadian rhythm is more disturbed when traveling from west to east. Many times people experiencing jet lag will use the sun to readjust sleeping patterns and help the body readjust.

In the same way, shift work causes disturbance in circadian rhythm because individuals will attempt work when the sun has set and sleep when the sun has risen. Statistics indicate that shift workers sleep an average of 2 to 4 hours less than day workers (Searle, 1995).

**REM and non-REM cycles causes.** When the circadian rhythm cues the body to go to sleep, many other processes take place. After falling asleep, the body goes through two cycles: the rapid-eye-movement (REM) cycle and the non-rapid-eye-movement (non-REM) cycle. Together, both cycles completely transpire in a period of 60-90 minutes (Searle, 1995). The non-REM cycle alone accounts for around 75-85 percent of sleep. During this cycle, the heart rate and respiration begin to slow down, leading into the second cycle, the REM cycle.

The REM cycle alone takes place approximately 4 to 5 times during a normal night's sleep (Sleeping disorders, 1994). It lasts for about 20-30 minutes (Searle, 1995).

When REM occurs, an individual's pulse, breathing, and blood pressure will increase and decrease (Sleeping disorders, 1994). Deep muscle relaxation also takes place (Searle, 1995). Beneath the eyelids, eyes rush back and forth in an unexplainable pattern. It is during this sleep phase that dreaming occurs (Sleep disorders - -part 1, 1994).

**Environmental Causes**

In accordance with biochemical causes, environmental causes can also disturb sleep. Environmental causes of sleep disturbances may or may not be avoidable. Some of the most common environmental sleep disturbance causes include light, noise, and temperature.

**Light disturbance environmental causes.** One of the primary environmental sleep disturbances is caused by light. The regulation of light and dark exposure plays an important role in an individual's ability to sleep. Melatonin will not be produced if the sleeping environment is brightly lit. Along with sunlight, indoor, artificial lighting can prohibit melatonin release (National Sleep Foundation, 2009a).

**Noise disturbance environmental causes.** Similarly, noises may cause disturbances in sufficient sleep achievement. Exposure to noise during sleeping hours may decrease the body's ability restore itself. The magnitude of noise pressure and type has the potential to cause alterations in the central nervous system. The National Sleep Foundation (2009b) stated that noise levels as low as 40 decibels and as high as 70 decibels prohibit sleep. Moreover, if sound decibels are numerous enough, the different cycles of REM and non-REM sleep may be redistributed, resulting in increased amounts of sleep time in the wake steps of the sleep cycle and decreased time in the deep sleep steps of the sleep cycle (Basner, Muller, & Griefahn, 2010).

**Temperature disturbance environmental causes.** As with light and noise disturbances, environmental temperatures that are exceptionally hot or cold for sleeping preferences can significantly hinder sufficient sleep. Zisapel (2007) found that "Under normal environmental conditions, body temperature and sleep propensity vary inversely across the day and night (p. 1178)." However, for REM-sleep to occur, the core body temperature must reach a minimum. The National Sleep Foundation (2009b) stated that a sleeping environment that is more than 75 degrees and lower than 54 degrees will disturb sleep. Consequently, environmental temperatures immediately before and after sleep onset may largely affect optimal sleep (Zispel, 2007).

## Short and Long-term Effects

After understanding the causes of sleep disturbances, the effects they have on the body become much clearer. Short-term effects can be indentified on a day-to-day basis. Even one night with insufficient sleep can be responsible for suppressed ability to perform daily functions (Tsui &Wing, 2009). On the other hand, long-term effects of sleep deprivation may not be apparent for several years. The long-term consequences of sleep loss may continue to grow into much larger health problems.

### Short-term Effects

There are a plethora of short-term effects that result from sleep disturbances. Some effects are barely detectable or may go unnoticed. However, the impact of sleep loss results from a decrease in cognitive abilities or changes in emotions.

**Decreased cognitive abilities affected.** In a recent study, Randall, Roehrs, and Roth (2008), found that sleeping disturbances can slow cognitive abilities, diminish motivation, lower concentration, and cause memory lapses. Lack and Wright (2007) also stated that a reduced amount of sleep at night will cause daytime sleepiness, irritability, diminished concentration, and other effects that may potentially affect the workplace and home. Furthermore, inadequate amounts of sleep can cause cognitive alterations in to both the endocrine system and to metabolic pathways (Landis, Parker, & Dunbar, 2009).

Amschler and McKenzie (2010) indicated that inadequate sleep affects the cognitive abilities of people both young and old. They found that many adults suffering from sleep deprivation have a slower reaction time and are more prone to memory loss. Moreover, a higher incidence of workplace accidents along with decreased performance was also apparent.

Likewise, students' academic performance and concentration have also been shown to decrease with sleep deprivation (Amschler and McKenzie, 2010). Tsui and Wing (2009) studied the effects of sleep deprivation on college students. One of the most substantial findings suggested that academic deterioration was linked to sleep loss. The researchers stated that sleep loss resulted in daytime sleepiness, which consequently led to decreased academic performance and added stress. Therefore, the student's abilities to perform cognitive daily academic responsibilities was driven into a vicious cycle of decreased academic performance resulting in increasing stress, along with greater sleep deprivation, and therefore an overall poorer sleep quality.

**Emotional changes affected.** Along with decreased cognitive abilities, emotions can change with lack of sleep. In many situations, undesirable circumstances that would not usually influence a person's mood will become extremely controversial when a person is sleep deprived. Likewise, mood swings, irritability, and hostility that have little or no attachment to an actual event may result from sleep debt (Searle, 1995). Schmidit and Van der Linden (2009) conducted a study to assess common emotions that are experienced with sleep deprivation. They found that participants were more likely to face counterfactual thoughts and emotions (including feelings of regret, shame, and guilt) near bedtime. As a result of the counterfactual thoughts, participants' sleep was disturbed.

One of the disturbances that researchers identified was a relationship between counterfactual emotional thoughts and dreams (Schmidt & Van der Linden, 2009). McNamara, Andresen, Arrowood, and Messer (2002) found that negative emotions at bedtime can be coupled with sleep-interfering dreams. Moreover, disrupting dreams cause a poor quality of sleep and can be compounded to produce sleep disorders such as insomnia. Furthermore, a repetitive sleep depriving cycle may begin to occur as counterfactual emotions continue to fluctuate, causing a poor quality of sleep, and producing greater sleep problems for individuals.

One of the most interesting results of the study was the relationship between women and sleep disturbances. The study indicated that women tend to have a harder time dealing with their emotions than men, thus experiencing greater sleep loss. Consequently, researchers predict that there may be a relationship between gender and hours of sleep characterized by greater sleep deprivation and insomnia for women than men (Schmidt &Van der Linden, 2009).

**Long-term Effects**

As with short-term effects of sleep deprivation, long-term effects can be detrimental to a person's health. Long-term effects of sleeping disorders may include obesity, cancer, and mortality. Further, such effects emphasize why it is imperative to make sleep a priority.

**Obesity effects.** Recent studies including individuals of all ages have shown a correlation between sleep and body mass index. In several studies of adolescents' sleeping patterns versus their caloric intake, findings indicated that daytime sleepiness was connected to negative eating behaviors that could lead to obesity. Food cravings, satiety, hunger, and caloric-intake were all affected by insufficient sleep (Landis, Parker, & Dunbar, 2009). Vgontzas, Lin, Papaliaga, Calhoun, Vela-Bueno, Chrousos, and Bixle (2008) stated that sleep deprivation can be a forerunner for obesity because caloric intake may increase due to altered levels of ghrelin and leptin appetite peptides. Landis, Parker, and Dunbar (2009) indicated that caloric intake increases in individuals who are not attaining sufficient sleep at night because of the increase in ghrelin. In the same way, Noland, Price, Dake, and Telljohann (2009) established that inadequate sleep results in an increase in ghrelin, which increases the desire for foods that are salty, sweet, and high in starch. "Thus, leptin and ghrelin have a reciprocal relationship, and sleep loss seems to alter these hormones in a way that could promote food intake and the development of obesity" (Landis, Parker, & Dunbar, 2009, p. 121).

**Cancer effects.** Along with possible links to obesity, long-term effects of sleep loss may be a determinant of cancer. Blask (2008) explained that when a person spends an increasing amount of time awake during sleeping hours, his or her nocturnal

production of melatonin is suppressed, causing sleep disturbances which weaken the immune system. As a result, immune suppression may cause an increase in the preponderance of cancer-stimulatory cytokines. In particular, breast cancer is one of the specific types of sleep deprivation associated cancers. Shadan (2008, p. 132) said, "it has been suggested that melatonin may play a protective role against breast cancer, and circadian disruption has been proposed as a risk factor for breast and colorectal cancer in women." Furthermore, Davis, Mirick, and Stevens (2001) stated that exposure to bright light during evening hours may increase breast cancer risk by suppressing melatonin production and possibly increasing the release of estrogen. A study of 813 cancer-free night shift workers conducted from November 1992 to March 1995 evidenced a connection between exposure to light during peak melatonin releasing hours (usually 1-3:00 a.m.) and increased breast cancer risk. After working two or more night shifts per week, 82% of the women who had achieved sufficient sleep prior to the study had higher estrogen release, thus increasing their risk for breast cancer.

In the same way, the risk of acquiring prostate cancer is equally increased with longer exposure to light. Although much research is still being done on the relationship between sleep and cancer risk, it is clear that acquiring adequate amounts of sleep may greatly reduce the risk of cancer. Moreover, the connection between sleep deprivation and cancer risk is so great that:

> The mutual reinforcement of interacting circadian rhythms of melatonin production, the sleep/wake cycle, and immune function may indicate a new role for undisturbed, high quality sleep, and perhaps even more importantly,

uninterrupted darkness, as a previously unappreciated endogenous mechanism of cancer prevention (Blask 2008, p. 26).

**Mortality effects.** Sleep plays a major role in longevity (Searle, 2000). The purpose of sleep is to bring about relaxation and repair that contribute to physiological homeostasis and psychological balance. Consequently, sleep debt causes decreased metabolism and endocrine functioning that resembles the effects of premature aging (Vgontzas, et al. 2007).

In addition to decreased metabolic and endocrine functions, the heart is also affected by sleep loss. In their discussion of long-term causes of sleep debt, Nilsson, Nilsson, Hedblad, and Berglund (2001) stated that cardiovascular disease, increased heart rate, and cancer were directly related to sleep debt and other leading causes for mortality.

A study of premature death in mice established significant links to sleep deprivation. Findings suggested that sleep disturbances may cause mortality due to the long-term effect they have on deoxyribonucleic acid (DNA). As with human beings, heat-shock genes are thought to prevent death by protecting the body from detrimental gene fluctuations. Therefore, when a person's sleep is disrupted, the likelihood for DNA damage to take place increases, which may in turn cause premature death (Shadan, 2008).

In the same way, Nilsson, Nilsson, Hedblad, and Berglund (2001) studied the impact of sleep problems that may be predictors for mortality. During a 17-year period of study of 22,444 male and 10,902 female participants, 1902 males and 397 females died due to sleep disturbance-related causes. Nilsson, et al. found that increased resting heart rates were more apparent in male participants. However, all participants who were sleep deprived were diagnosed with a greater risk for cardiovascular disease due to

hypothesized metabolism alterations and obesity. Likewise, premature death was linked to sleep disturbance due to the increased sympathetic nervous activation (SNA), which inhibits sleep onset. SNA also is thought to be an indicator for premature death due to an increased exposure to chronic stress. Consequently, researchers concluded that sleep disturbance is a predictor of both total and cause-specific mortality.

## Treatments

In order to manage sleep disturbances before they become detrimental, there are several treatment methods. Although treatment is not usually as effective for long-term sleep loss, it can be highly beneficial in treating short-term sleep loss. Some currently used methods include bright light treatment, sleeping pills, and cognitive behavioral theories.

### Bright Light

Appropriate timing of bright green and blue light can produce necessary readjusting for normal sleeping patterns (Lack & Wright, 2007). Gordijn, Beersma, Korte, and Hoofdakker (1999) observed the way that dim light affects both body temperature and circadian rhythm, in order to assess the sufficiency of sleep. Researchers used dim light melatonin onset, which they defined as “the time when melatonin concentration starts rising in the evening (p.163),” as one of their indicators of a healthy circadian rhythm. When abnormal dim light melatonin onset methods were tested, they provided a concise treatment method for the appropriate light exposure timing.

Many individuals who travel frequently use bright light to help decrease jet lag. Whether using the light from the sun or artificial bright lighting, by being exposed to

light either earlier or later in the morning and night, individuals can reset their biological clocks to earlier or later times in the day. Although, it usually several days to readjust, light exposure has been effective in treating sleep deprivation problems (Gordijn, Beersma, Korte, & Van Den Hoofdakker, 1999). In the same way, Lack and Wright (2007) indicated that re-entrainment of the circadian pacemaker can be accomplished through the use of bright light. They also found that some differences between light duration and alternate wave lengths affected sleep efficacy. For example, studies have shown that circadian phase delays of approximately 30 minutes may occur with exposure to 1 hour of bright light pulses introduced prior to regular bedtime and immediately after waking up. Furthermore, studies have found that phase alterations of about 2.5 hours occurred with a 4 hour light pulse of 1200 lux (with one lux equaling the brightness of a 0.0929 foot-candle). Treatment methods for circadian changes support a greater circadian change with longer periods of administering light. Likewise, the effectiveness of light treatment can be confirmed by the length of the light wave. Blue and green lights, which have shorter wavelengths than yellow and red light, tend to decrease melatonin secretion and cause changes in the circadian phase change. Therefore, when used to treat sleeping disturbances, using shorter length light waves is the recommended method for treatment.

**Sleeping Pills**

Oral melatonin supplements are frequently used to treat sleep deprivation. Due to the fact that melatonin is naturally found in some foods, the U.S. Dietary Supplement Health and Education Act of 1994 deemed it permissible to sell as a dietary supplement. Therefore, the Food and Drug Administration has no control of melatonin supplement

production. Several studies have been done to assess the effectiveness of melatonin supplements (National Sleep Foundation, 2009a). Melatonin supplements are most frequently taken to fight sleep disturbances and jet lag, and to promote healthy immune functioning. Aside from the circadian-rhythm changes melatonin causes, it is thought that melatonin may also stimulate melatonin-releasing receptors (Randall, Roehrs, & Roth, 2008). The National Sleep Foundation (2009a) stated that taking a melatonin supplement may be useful if it is taken in the correct amounts and at the appropriate time of day. However, research has not found any solid information about the effectiveness of a melatonin supplement. In comparison to the body's natural production of melatonin (about 0.5mg), supplements under 75mg had barely detectable effects. Therefore, safety is a concern (Randall, 2008).

Low-dose antidepressants are also used as sleeping aids. Antihistamines, diphenhydramine, and various herbal pills can be taken to achieve sleep. Due to the sedative nature of antihistamines they are frequently used over-the-counter sleep aids. Research has evidenced that using antihistamines to treat insomnia may be effective for a couple nights, but is not useful in treating long-term sleeping disturbances (Randall, 2008).

Likewise, diphenhydramine HCl and diphenhydramine citrate are components of many sleep aids. Benadryl, for example, has about 12.5-25 mg of diphenhydramine, and is commonly used to induce sleep. If used for a one week period, it has aided in sleep quality, duration, and other disturbances caused by insomnia. Studies have supported the effectiveness of diphenhydramine as a sleep aid, but only recommend it for short-term use due to its potentially addictive nature (Randall, 2008).

Herbal sleep aids are also used to treat sleeping disturbance. One of the primary herbal supplements taken for insomnia and anxiety is called Valerian. Valerian is a flowering plant that has over 200 different species. Studies have produced contradictory results concerning Valerian's effectiveness (Randall, 2008).

**Cognitive Behavioral Therapy**

In a recent study, Phillips (2009) examined how Cognitive Behavioral Therapy (CBT) was implemented into a sleep treatment method. The CBT included recommendations for participants to go to bed only when they were sleepy, to get out of bed if they could not fall asleep in a timely fashion, to only use their bedroom for sleeping purposes, and to get up at the same time every morning.

Similarly, in a study of 20 sleep deprived participants, CBT in the form of stimulus control, sleep reduction, cognitive therapy, and sleep hygiene education was implemented for a month's time. Immediately before and directly after CBT was completed, sleep was assessed through the use of sleep logs, Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS), the Pittsburgh Sleep Quality Index (PSQI), and several other methods. Findings supported that when cognitive perspectives on sleep achievement were positively corrected, sufficient sleep was more likely to be achieved (Sato, Yamadera, Matsushima, Itoh, & Nakayama, 2010).

A type of CBT used for patients with insomnia utilized classical conditioning, or the response to a new stimulus, to provoke sleep. Some of the conditioning methods included getting out of bed if sleep could not be reached within 20 minutes of getting in bed, rising at the same time every morning, removing potential sleeping distractions (such as clocks), and avoiding television and reading before bed. The point of each

conditioning method was to “break the association between wakefulness and lying in bed” (Sleep disorders - -part 1, 1994, p. 3).

## Prevention

Treatment methods for sleep disturbances can be beneficial to temporarily improve sleep loss. However, in order to avoid long-term sleep problems, use of recommended prevention methods should help most sleep disturbances and treatment will become unnecessary.

### Exercise

One of the primary prevention methods for sleep disturbances is participating in regular exercise. According to Lack and Wright (2007), moderate to high intensity exercise during the day has resulted in an increase in the onset of melatonin excretion, producing a melatonin phase advance. Likewise, the National Sleep Foundation (2009b) stated that regular exercise is conducive to sleep. Regular exercise increases alertness, metabolism, and energy levels to produce maximal daytime functioning. It is also an excellent relaxant (Searle, 2000).

Although regular exercise encourages sleep, if done later in the day it may inhibit sleep. Instead, researchers suggest that physical activity should be completed at least 3 hours before going to bed. Moreover, since exercising causes body temperature to rise, it may take up to 6 hours for the body to cool back down. Therefore, exercising in the late afternoon allows the body temperature to cool back down around the time that sleep usually occurs. Since, lower body temperatures lead to sleep onset, the decrease promotes sleep (National Sleep Foundation, 2009b).

**Sleep Hygiene**

Noland, Price, Dake, and Telljohann (2008), stated that a sleeping environment that promotes sleep is one that does not have extreme temperatures and has no noise or light pollution. Likewise, The National Sleep Foundation (2009b) confirmed that a sleep-conducive environment should be dark, quiet, cool, and comfortable. Therefore, corrective actions should be taken if sleep cannot be achieved.

**Environmental light.** One way to achieve sleep hygiene is through proper use of environmental light. As stated previously, light can inhibit the release of the primary sleeping agent; melatonin. Even artificial indoor lighting can be bright enough to inhibit the release of melatonin. Therefore, along with dim lighting, using an eye mask or light-blocking curtains may help sleep onset as well as enable individuals to sleep longer in the mornings after sunrise (National Sleep Foundation, 2009a).

**Environmental noise.** Along with controlling environmental light, actively working to reduce environmental noise is a component of sleep hygiene. As stated before, since noise levels as low as 40 decibels and as high as 70 decibels prohibit sleep, a quiet sleep environment is vital. However, studies *have* found that the body adapts to hearing familiar noises (even loud sirens or city noises). Therefore, uncommon noises are usually responsible for sleep disturbance. As a result, wearing earplugs or being soothed by the sound of a fan or air conditioner may aid sleep onset (National Sleep Foundation, 2009b).

**Environmental temperature.** Along with managing noise levels, having a sleep environment with suitable temperatures is also a factor in sleep hygiene. The temperature of a room can be an extreme sleep disturbance. Although temperature preferences tend to

change from person to person, researchers have found that for most individuals, a sleeping environment between 55-74 degrees is optimal (National Sleep Foundation, 2009b). Likewise, as discussed previously, for sufficient sleep to occur, the body temperature must drop (Sleeping disorders, 1994). Therefore, in order to prevent sleep disturbance, scientists recommend that the sleeping environment should be slightly cool. Moreover, air conditioners and humidifiers may help to keep the room at a good sleeping temperature (National Sleep Foundation, 2009b).

**Beneficial sleeping behaviors.** In addition to producing an environment that promotes sleep, proper sleep hygiene also includes practicing beneficial sleeping behaviors prior to bedtime. First and foremost, by establishing a normal bedtime routine that is relaxing, sleep becomes more inviting (National Sleep Foundation, 2009b). Furthermore, having a consistent sleep/wake schedule will help the mind and body predict when sleeping should occur.

Other sleep hygiene behaviors include limiting foods and liquids, as well as trying to relax and unwind. Consuming too many liquids before bed may disrupt sleep by causing a person to have to get up to use the bathroom. It is essential to avoid stimulants such as caffeine and nicotine at least 6 hours before bed for adequate sleep to occur. Caffeinated beverages should not be consumed after 3:00 or 4:00 pm (Sleep disorders - - part 1, 1994). Likewise, although heavy snacks that contain spices or high-sugar content are not recommended before bed, a light snack that is high in carbohydrates may help the body to relax. Along with carefully choosing food and drink prior to sleep, taking a warm bath to release muscle tension or unwinding by listening to soft music or by reading a book may be components of sleep hygiene (Searle, 2000).

Once in bed, there are other ways to promote sleep. First, it is necessary for individuals to be proactive in ridding the mind of any stressful problem solving which has the potential to disturb sleep. Second, ignoring the time or moving the clock may be helpful since worrying about the amount of sleep time may cause anxiety, and thus prohibit sleep. Third, researchers suggest that the position people find themselves in when they wake up is a good position to get into when attempting to fall asleep. Fourth, if sleep onset does not occur shortly after getting in bed, getting up and doing something commonplace many times causes sleepiness (Searle, 2000).

## Conclusion

In order to daily function at optimal levels, sleep is vital. There are innumerable processes that work together for sleep to be reached both biologically and environmentally and that can result in sleep disturbances. Likewise, the short and long-term effects of insufficient sleep on the body can cause cognitive and emotional alterations that will alter everyday tasks, as well as, the increased possibility for obesity, cancer, and mortality. Consequently, treatment methods are frequently needed to overcome sleep disturbances through the use of bright-light treatments, sleeping pills, and cognitive behavioral therapy. Furthermore, in order to prohibit sleep disturbances as best as possible, prevention methods including exercise and sleep hygiene can prevent sleep disturbances from occurring. Therefore, by having an understanding of the known causes, short and long-term effects, treatment methods, and prevention for sleep disturbances, individuals make steps towards sufficient sleep. Moreover, combating sleep disturbances with practical sleep hygiene techniques can produce an overall better quality of life through proper health and wellness.

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