

**Physiological Effects
Of
Sleep Deprivation
Working Two Shifts
and
Way to Mitigate Health Risk**

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Statement of the Problem:

Developing Human Factors Engineering (HFE) countermeasures to alleviate sleep deprivation when working two shifts on the same job and mitigation of health risk is key to performance.

Introduction:

With global outsourcing and time zone differences, the availability demand of professional high technology workers has become 24x7. Some professionals are working two shifts; one shift during the day on their local time when the outsourcing team is asleep, and a second shift on their local night time to support their outsourced team when they are awake. Many workers tend to follow schedules at work that are outside of the typical "9 to 5" business day. To meet the demands of globalization and our 24-hour society, many companies have resorted to having employees work various shifts. Companies see this as a very competitive advantage because having employees work various shifts is a great method of increasing production without changes in infrastructure which could otherwise be very costly. Even though the writing of this was to reflect shift work in high tech companies, it seems that millions of Americans from other occupations to include, but not limited to, doctors and nurses, pilots, bridge-builders, police officers, customer service representatives and commercial drivers are in the same boat. With the efforts to support two working shift and/or a combination

thereof, sleep deprivation is common, and many not may be aware of the health risk or the countermeasures to alleviate those risks to maintain performance.

Background:

Sleep deprivation goes back to the day of the Roman Empire when soldiers were required to march days on end to meet their military quest objectives. More recently in this century, the United States Third Army in World War II under the command of General George S. Patton was under constant demands to move forward and this meant many days without rest or sleep. General Patton even commented once that “a soldier could go on fighting three full days before he needed rest or sleep”. In today’s professional high tech world, the same idea of workers being available 24x7 has become common place---many are working 18 hours on combined shifts. Awareness needs to surface that working too many hours leads to sleep deprivation, which sleep deprivation in turn leads to health risks, and to prevent potential health risks, we need to be more diligent about Human Factor Engineering countermeasures than before.

Within the human organism, the human body follows a set of daily fluctuations. There rhythmic physiological events in include body temperature, heart rate, blood pressure, and hormone secretions. These events are known to have their own pacemaker or internal clock which runs on daily cycle. Sleepiness, blood pressure, and temperature are known to be coupled together. The body tends to change its

physiological functions during the day and night. During the day the body is prepared for work, whereas at night, but at night, sleep is the norm. A circadian rhythm is a roughly-24-hour cycle in the biochemical, physiological or behavioral processes of living entities.

Lack of sleep has its potential sleep disorders which are categorized as physiological. Studies show that sleep deprivation severely affects the human body's ability to metabolize glucose which can lead to early diabetes of Type II. Deprivation of sleep has been known to affect brain functions. The effects of growth have been noticed in with sleep deprivation. The hearing process has been seen to be affected by lack of sleep. Human performance can widely be affected by sleeping fewer hours. Weight gain and continued obesity in some populations has been noticed. These types of physiological disorders need to be looked at more closely associated countermeasures should be part of normal routines to continue being healthy.

Analysis

Lack of sleep during normal night hours tends to make a person feel hungrier during the day because there are hormones that are secreted in greater number that make a person feel hungrier; consequently, the human tends to eat more. Sleep and appetite are closely intertwined. Curtailment of sleep leads to a marked decrease in levels of leptin (a hormone that inhibits appetite) and an increase in levels of ghrelin

(stimulates appetite). The resulting hormonal imbalance leads to an increase in appetite that is disproportionate to the caloric demands of the extended hours of wakefulness. When the human eats more they tend to gain weight. When they gain weight, diabetes type 2 tends to be initiated and this is when the body fails to use body insulin improperly. Diabetes is called the silent killer because irregular sugar levels can go undetected for years—one can have low sugar level or high sugar levels. In low sugar levels the diabetic feels cold, clammy, and shaky. In periods of high sugar levels, the diabetic may experience profuse sweating, headaches, and lightheadedness Diabetes is a disease in which the body can no longer produce or use its own insulin properly, and this result in sugar to accumulate in the blood often leading to other various complications. Continuing to eat in irregular patterns in many has lead to obesity because sleep deprivation disrupts hormones that regulate metabolism of glucose and appetite.

Sleep deprivations can affect the brain adversely. Simple verbal tasks can become difficult to perform. In humans that are sleepier, the regions of the brain have been known to be more active. When there is abnormal activity in the brain, depending on what the human is working on, many times the brain will attempt to use other senses to realign with adverse affects due to not getting enough sleep---this could in turn affect other areas of sight, sound, and smell. Memory tends to decrease in humans that sleep less. This happens because greater activity is needed in the parietal lobe of the brain,

but with less sleep there tends to be less activity; consequently, less memory performance. When memory becomes an issue for humans, then learning become difficult because there are limits to the brain's ability to remember information. Sleep allows the brain to reprocess new information so that the memory of it sticks. For more severe affects this may include bipolar disorder in that lack of sleep made humans incapable of tying a response appropriately to something that happens. Sleep tends to give rest to receptors in the brain which allow humans to regulate how they feel, and doing otherwise tends to increase stress hormones.

Sleep deprivations affects melatonin levels in the human body. Circulating levels are found to vary in daily cycles. Melatonin is very critical to the regulation of circadian rhythms. The melatonin signal form part of the system in the body that regulates by causing drowsiness and lowering the body temperature. More importantly, melatonin is known to interact with the immune system and is used the treatment of infectious diseases including viral, bacterial, and even potentially the treatment of cancer. Melatonin is known to serve as a primary function in body antioxidant activity. Production of melatonin is inhibited by light and allowed by darkness for this reason it is called the hormone of darkness---melatonin has dependence in light. Secretion of melatonin as well as the quantity found in the blood stream tends to peak in the middle of the night, and will decrease after the second half of the night. Melatonin has been known to be an effective treatment in depression. Consequently, if one is up during the

day in light and then again at night in light, there will be reduction in needed melatonin levels in the body, and this sets for unhealthy body chemistry.

Growth in humans can be severely hampered. There is a hormone called cortisol that is reduced when humans do not get enough rest. When this hormone is reduced in the human body, growth has been known to be stunted. In correlations with growth, it has been noticed that that body tend to heal from wounds slower. Growth and associated healing are key to remaining a healthy body.

One of the bigger risks common to us all is the drowsy driver. You can see him/her on the road sometimes. Even though most now know that driving drunk can be hazardous, driving while sleepy has the equal if not greater hazards. Drowsiness will reduce the time it takes for a driver to react, it will decrease the awareness on the road to other drivers around them, and overall it impairs judgments. These type of drivers can be noticed having difficult focusing, having thoughts that are not connected, they tend to have trouble keeping their head upright, they can be seen drifting lanes and crossing over that "white line", they tend to drive impatiently---possibly honking their horn at a red stop light a second immediately after it turns green to go, and most dangerous of all, you will see these drivers speeding due to aggressive irritable behavior. Lack of sleep deprives drivers of thinking about safety on the road.

In reviewing these sleeping disorders, eating disorders, mental disorders, physical disorders, and potential weight problem disorders, one can see that this is just the tip of the ice berg. Nevertheless, we need to become more aware of potential hazards that may affect our lives but more importantly, we need to look at potential solution that may assist us in mitigating risks.

Interventions

Without doubt if one could select their preferred work shift hour than it would be best to select only day shift. This would mean that one works from morning to afternoon. With this type of normal work shift, the body would be allowed to rest “at night”. Performance is highest when the body is works during the day and sleeps at night. We should not overlook the obvious, but ensure the shift length is about 8 hours.

Although permanent night shift may seem like the solution to follow it has been found that this type of arrangement is not really permanent. This is because the when the weekend hits, one tends to be interrupted by day on the weekends. This irregularity will have similar complications to internal rhythms. When permanent night shift is chosen, ensure the light are very bright in the building (high illuminations levels of 2000 lux or more) because these levels help suppress the production of the hormone melatonin which causes drowsiness. Playing stirring music on night shift may be

applicable to reducing drowsiness. If needed by not really recommended, permanent night workers should drink caffeinated hot or cold drinks. Sleep should be taken directly after night shift hours—do not get home, do any activity, and then sleep.

When sleeping during the day, ensure the room is very dark and there are no interruptions. Set times ahead of schedule to meet with family and friends.

When possible, manage day shift and night shift with some insights. One, the number of consecutive night shifts should be a few as possible. If you work day shift and then part of full night shift that one day, do not do this too often with rest between. If you are needed to work both day shift and night shift, then after night shift ensure you get some sleep rather than volunteering for that “6:00 am” meeting. Best to have only one single night shift, followed by a free day, interspersed with other work shifts. Each night shift should be followed with at least 24 hour of free time. Each shift plans should contain at least two consecutive 24 hour day work free days----with the weekend preferred. Overall, the number of free days per year should be at least as many as for the continual day worker.

Sleep loss should be reduced to a minimum at all times. Avoid stimulates right before bed time otherwise this will just keep you up longer when you do decide to fall asleep. Develop and create sleeping routine even if you must work both day shift and night shift---try sleeping once in the morning and once in the evening. Avoid eating

enormous meals before bedtime that otherwise keep you up watching television and encourage continued loss of sleep. If possible, eat 6-8 snacks during the day routinely rather than enormous meals during the day. When possible fit a nap when possible; if you know you will be working another shift after day shift, then take a nap or sleep when you get home, so that you are not drowsy on the night shift. Naps tend to improve “being wake” but naps should be kept to 45 or less so as not to enter deep sleep in that waking out of sleep will lead to feelings of tiredness or even fatigue. Prioritize on sleep time and don’t be afraid to take sleep if you need it. Dark rooms help significantly when trying to sleep in that the body is programmed to sleep when lightening is dark—also, keep the room a cool temperature and if you are not bothered by it, use earplugs to increase quietness. Avoid all night cram sessions in school. Remember, the brain, like the rest of the body, needs rest too. It works better when it's well rested.

Exercising is also plays a very important role to one’s health. Determine a schedule for exercising that will not over burden. If you have not exercised before, try small shorts walks at first. For those that are most athletic, 30-45 minute bike rides daily will increase metabolism rates. Excersizing 30 minutes daily for 5 of the 7 week days has also proven to reduce cholesterol levels in humans. If possible during work hours, try to take intermittent 15 minute walks through the day. The opposite has the same affect---for some, just relax during intermittent periods during the day---listen slow calming music. Exercise can be as simple as taking a walking break to the lunch room

every hour while you are working at your company, and it need not be overly stressful.

Start small and work your way up in exercise.

Continue to discuss and exchange ideas with your friends on how to cope with problems of working various shift hours. It doesn't hurt to be proactive to have a support group. Some ideas that have come out of support group are the following. Avoid long commutes and extended hours—try to find a job local to your home. Work with other to help you start alert. If you get breaks do your best to be as active as possible during those breaks. Do your best to do the most difficult task when you first arrive at work and do your best not to leave challenging tasks until the end of your shift---this because you may feel the most fatigue at that time. Be proactive at your workplace to make napping priority to the company. If you must sleep during the day, wear dark glasses when you drive home in the sunlight. Do your best to avoid alcohol because it tends to disturb sleep.

Conclusion

The body tends to function best when it works during the day and when it rests at night. If possible, the circadian rhythm should not be interrupted or kept to a minimum. Be aware that prolonged periods of work time will interrupt sleep and this would lead to health risks. Sleep deprivations is a serious problem that can me be mitigated by

Human Factor Engineering (HFE). Avoid sleeping disorders, eating disorders, mental disorders, weight disorders, etc by being aware that day shift is best to work and night time is best to sleep, keep a consistent sleep schedule, determine a consistent eating schedule, take time for relaxation, and continue to exercise when possible. Taking HFE into consideration can lead one to a healthier lifestyle but more importantly reduce health risk complications.

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