

LIST OF SELECTED SCIENTIFIC REFERENCES

1) General references:

Working the Shift: A Self-Health Guide.

Shapiro CM, Heslegrave RJ, Beyers J, Picard L. (1997) JoliJoco Publications Inc. 112 pages. ISBN 0-88753-292-6.
- Written for the night workers. Includes useful information and suggestions for the workers and their family.

Sleep And You: Sleep Better, Live Better

Diane Boivin 2014 www.dundurn.com/books/sleep-and-you

- An easy and readable guide to the latest scientific information on how and why to sleep better and improve your wellbeing.

Circadian rhythms have broad implications for understanding brain and behavior.

Silver R & Kriegsfeld LJ. European Journal of Neuroscience, 39:1866-1880, 2014.

- For advanced readers who want to go deeper in the functioning of the biological clock. This review covers all aspects, from the generation of circadian rhythms at the molecular level to the impacts of circadian rhythms on sleep and health.

Circadian typology: A comprehensive review.

Adan A et al. Chronobiology International, 29(9): 1153-1175, 2012.

- Update of current scientific knowledge on biological and psychological characteristics of chronotypes (morning and evening types), and on the links between chronotype and adaptation to night work.

2) Specific references:

Effects of lack of sleep

On health:

Sleep Foundation's updated sleep duration recommendations: final report.

Hirshkowitz M et al. Sleep Health, vol. 1, p. 233-243. 2015. <http://dx.doi.org/10.1016/j.sleh.2015.10.004>

- The current consensus of sleep specialists is that most adults need at least 7 hours of sleep per day to be in good health.

Repeating patterns of sleep restriction and recovery: Do we get used to it?

Simpson NS et al. Brain, Behavior, and Immunity, 58:142-151, 2016.

- One can get used to have little sleep, but lack of sleep may have negative effects on health even when we are not consciously aware of them.

The metabolic consequences of sleep deprivation.

Knutson KL et al. Sleep Medicine Reviews, 11:163-178. 2007.

- Review of the mechanisms involved in the association between lack of sleep and increased risk of diabetes or obesity.

A systematic review assessing bidirectionality between sleep disturbances, anxiety and depression.

Alvaro PK et al. Sleep, 36(7):1059-1068, 2013.

- Review of the literature showing that lack of good-quality sleep increases the risk of suffering from anxiety and depression, and that conversely, mood disorders increase the risk of having sleep disorders.

On alertness and risk of accidents:

Behavioral and physiological consequences of sleep restriction.

Banks S & Dinges DF. J Clinical Sleep Med, 3(5):519-528. 2007.

- Review of the effects of chronic lack of sleep (less than 7 h per night). There are large individual differences in the way people react to lack of sleep, most underestimate how much their performance decline without enough sleep.

Fatigue, alcohol and performance impairment. Dawson D & Reid K. Nature, 388:235, 1997.

- Moderate sleep deprivation has the same effects on performance as a moderate consumption of alcohol. After 17 hours awake, psychomotor performance decreases as much as when having an alcohol blood content of 0.05%.

Deterioration in driving performance during sleep deprivation is similar in professional and nonprofessional drivers.
Howard ME et al. *Traffic Inj Prev*, 15(2): 132-137, 2014.

- After sleep deprivation, the performance decline measured with a driving simulator was the same in professional and nonprofessional drivers. So, professional drivers do not react better to lack of sleep than nonprofessional drivers.

On appetite and body weight:

Short sleep duration is associated with reduced leptin, elevated ghrelin, and increased body mass index.

Taheri S et al. *PloS Medicine*, 1(3):e62, 210-217, 2004.

- In people who sleep less than 8 hours per night, the increase in body weight (body mass index) is proportional to the decrease in hours of sleep. Study participants with a short sleep duration also have less leptin (satiety hormone) and more ghrelin (hunger hormone), which may increase both appetite and body weight.

Eating decisions based on alertness levels after a single night of sleep manipulation: a randomized clinical trial.

Pardi D et al. *Sleep*, 40(2):zsw039, 2017.

- This laboratory study shows that a reduction in sleep duration influences the participants' eating decisions the next day. The higher is the increase in drowsiness, the more likely it is that participants choose high-caloric and "non-healthy" food for their next day snack, and the more calories they eat in total.

Impact of night work and adaptation strategies

Sleep and night work:

Sleep loss and fatigue in shift work and shift work disorder.

Akerstedt T & Wright KP. *Sleep Med Clin* 4(2):257-271, 2009.

- Review of sleep and drowsiness problems reported by night workers.

Interaction of age with shift-related sleep-wakefulness, sleepiness, performance, and social life.

Bonnefond A et al. *Exp Aging Res*, 32:185-208, 2006.

- Age accentuates the impact of night work on daytime sleep duration and nighttime performance. However, older workers have less complaints of drowsiness at night compared to younger workers.

Effects of alcohol, melatonin and sleeping pills on sleep:

Alcohol and sleep I: Effects on normal sleep.

Ebrahim IO et al. *Alcohol Clin Exp Res*, 37(4): 539-49, 2013.

- Literature review on the effects of alcohol on sleep in healthy individuals. Alcohol helps sleep onset but interferes with sleep continuity in the second half of night.

Pharmacological interventions for sleepiness and sleep disturbances caused by shift work.

Liira J. et al *Cochrane Database Syst Rev*, Issue 8, Art. No.:CD009776, 2014.

- Synthesis of the results of 9 studies on melatonin and 2 studies on sleeping pills in the context of night work. Melatonin prolongs sleep time during the day by 24 minutes on average. Studies on sleeping pills (zopiclone and lormetazepam) were not of high quality and did not show any beneficial effects on daytime sleep.

Sleep facilitating effect of exogenous melatonin in healthy young men and women is circadian-phase dependent.

Wyatt JK et al. *Sleep*, 29(5):609-618, 2006.

- That study compared the effect of melatonin 0.3 mg (physiological dose), melatonin 5.0 mg (pharmacological dose) and placebo when given 30 minutes before bedtime. With melatonin, daytime sleep was less interrupted by awakenings. Beneficial effects on sleep were not better with 5.0 mg than 0.3 mg, but melatonin 5.0 mg remained longer in the blood (>10 hours) which can decrease alertness levels after waking up.

Effects of caffeine

Effects of caffeine on daytime recovery sleep : a double challenge to the sleep-wake cycle in aging.

Carrier J et al. *Sleep Medicine*, 10:1016-1024, 2009.

- Participants in this study were given the caffeine equivalent of one cup of coffee before going to bed in the morning, after a night of sleep deprivation. Caffeine decreased daytime sleep quality in all participants, but the negative effect on sleep was significantly greater in older participants (45-60 y.) than in younger ones (20-30 y.).

Circadian adjustment, exposure to light, and choice of timing for daytime sleep:

Do permanent night workers show circadian adjustment? A review based on the endogenous melatonin rhythm.

Folkard S. *Chronobiology International*, 25:215-224, 2008.

- Shows that the biological clock adjusts very little to night work, even in workers having a permanent night schedule.

Association between melatonin secretion and daytime sleep complaints in night nurses.

Benhaberou-Brun D, Lambert C, Dumont M. *Sleep*, 22(7): 877-885, 1999.

- That study compared two groups of night nurses, with or without sleep problems when sleeping during the day. The biological clock of most nurses without daytime sleep problems had a partial adjustment to the night work schedule, as shown by their rhythm of melatonin secretion.

Profile of 24-h light exposure and circadian phase of melatonin secretion in night workers.

Dumont M et al. *J Biological Rhythms*, 16(5):502-511, 2001.

- The daily profile of light exposure was different between night nurses with or without a partial adjustment of their biological clock to the night work schedule.

Controlled patterns of daytime light exposure improve circadian adjustment in simulated night work.

Dumont M et al. *J Biol Rhythms* 24(5):427-437, 2009.

- This laboratory study has tested the combination of controlled exposure to light and darkness with sleep episodes scheduled before or after simulated night shifts. Results showed positive effects on the adjustment of the biological clock.

Effects of partial circadian adjustments on sleep and vigilance quality during simulated night work.

Chapdelaine S, Paquet J, Dumont M. *J Sleep Res* 21:380-389, 2012.

- The same laboratory study of simulated night work found that alertness and mood were improved during the night shift when the participants slept before the night shift, from 2 to 10 p.m.

Shift work: health, performance and safety problems, traditional countermeasures, and innovative management strategies to reduce circadian misalignment.

Smith MR & Eastman CI. *Nature and Science of Sleep*, 4:111-132, 2012.

- Review of various strategies used to improve tolerance to night work. The paper includes detailed explanations and many examples for the combined use of bright light, darkness, sunglasses, and sleep timing to reduce the conflict between the night work schedule and the internal biological clock of the workers.

Risk of road accidents:

High risk of near-crash driving events following night-shift work.

Lee ML et al. *PNAS* 113(1):176-181, 2016.

- This study compared the driving skills of night workers in the morning, either after a night of sleep or after a night of work. Results showed increased drowsiness and decreased driving performance after night work, with a significant increase of near-misses (leaving the road, reactions too slow, etc) after 45 minutes of driving.

Beneficial effects of naps:

Effects of napping on sleepiness and sleep-related performance deficits in night-shift workers: a systematic review.

Ruggiero JS et al. *Biological Research for Nursing*, 16(2):134-142, 2014.

- Review of the effects of naps taken during a night shift. Most studies find an improvement of alertness and performance after 20-, 30-, or 40-minute naps, especially when taken before 4 a.m.

Professional shift-work drivers who adopt prophylactic naps can reduce the risk of car accidents during night work.

Garbarino S et al. *Sleep*, 27(7):1295-1302, 2004.

- A nap before the night shift decreases by 48% the number of accidents in policemen working on the road.

Laboratory and field studies of naps and caffeine as practical countermeasures for sleep-wake problems associated with night work.

Schweitzer PK et al. *Sleep*, 29(1):39-50, 2006.

- Naps before the night shift improve alertness and performance during the night shift, especially when combined with the use of caffeine at the beginning of the night.

Duration of sleep inertia after napping during simulated night work and extended operations.

Signal TL et al. *Chronobiology International*, 29(6): 769-779. 2012.

- Using performance tests given during a simulation of night work, the authors estimated to less than 15 minutes the duration of performance impairment due to sleep inertia after a nap shorter than 60 minutes.

Eating and night work:

Eating and shift work – effects on habits, metabolism, and performance.

Lowden A. et al. *Scand J Work Environ Health*, 36 (2):150-162, 2010.

- A comprehensive review that explains the effects of night work on metabolism in relation to eating habits. Includes recommendations for the timing and contents of meals when working nights.

Physical activity:

Physical activity is associated with higher sleep efficiency in the general population: the CoLaus study.

Gubelmann C et al. *Sleep*, 41(7):1-9. 2018.

- Large study including 2649 participants, men and women aged 45 to 86 years, showing that the sleep of individuals physically active is of higher quality compared to the sleep of more sedentary people.

Feasibility of a telephone and web-based physical activity intervention for women shift workers.

Neil-Sztramko SE et al. *Trans Behav Med*, 7(2):268-276, 2017.

- Study conducted on 20 women night workers. Results showed that physical activity of moderate intensity, more than 150 minutes per week, was accompanied by a decrease in body weight and by a significant improvement of energy level, alertness, mood and sleep quality.

Circadian phase-shifting effects of nocturnal exercise in older compared with young adults. Baehr EK et al. Am J Physiol Regul Integr Comp Physiol, 284:R1542-R1550, 2003. + *Phase-advance shifts of human circadian pacemaker are accelerated by daytime physical exercise.*

Miyazaki T et al. *Am J Physiol Regul Integr Comp Physiol*, 281:R197-R205, 2001.

- The first study shows that physical activity early in the night resets the biological clock at a later time, which is an appropriate strategy for the night workers who sleep mainly after their night shift. The second study shows that physical activity during the day adjusts the biological clock at an earlier time, which is a good strategy for the workers who sleep before their night shift.

Night work and risk of cancer:

Carcinogenicity of night shift work.

Working group (27 scientists from 16 countries) for the International Agency for Research on Cancer (IARC).

Lancet Oncol, July 4, 2019. [http://dx.doi.org/10.1016/S1470-2045\(19\)30455-3](http://dx.doi.org/10.1016/S1470-2045(19)30455-3)

- Review of recent studies concerning a possible link between cancer and night shift work. The Working group concluded that night shift work probably can increase the risk of breast, prostate, and colorectal cancer, under certain circumstances. Research is still too limited to know how much increase risk and which circumstances increase the risk. Reducing other sources of risk of cancer by adopting a healthy life style remains a good strategy to adopt.