



# Interrelation between *Qai'lullah*, Blue Light Exposure and Neurocognitive Performances: A Short Review

Nur Farhana Fadzil<sup>1</sup>, Siti Amira Othman<sup>2\*</sup>

<sup>1</sup>Universiti Sains Islam Malaysia,  
Fakulti Sains dan Teknologi, 71800, Nilai, Negeri Sembilan, MALAYSIA

<sup>2</sup>Universiti Tun Hussein Onn Malaysia,  
Faculty of Applied Sciences and Technology, Pagoh, 84600, MALAYSIA

\*Corresponding Author

DOI: <https://doi.org/10.30880/jqsr.2021.02.02.001>

Received 21 June 2021; Accepted 25 August 2021; Available online 19 December 2021

**Abstract:** *Qai'lullah* or napping is a phenomenon that is widely practiced in the world. Islam advocates mid-day napping as it is primarily practiced by the Prophet Muhammad (pbuh). Scientists and scholars also acknowledge the benefits beyond this practice after various research and studies done. Hence, this article emphasizes topic of sleep in Islamic insight, their stages of sleeps according to Quran and the practiced of *Qai'lullah* or mid-day napping. The high-energy blue light exposure from the natural source, Sun and also digital screens reported reduce visual contrast and affect the sharpness and clarity by creating glares lead to mental and physical fatigue. Thus, a short nap in the mid-afternoon helps to boost memory, lift our mood, and improve job performance. The effect associated with *qai'lullah* are also being reviewed including improved the neurocognitive performance, alertness, recover the loss night sleep and enhanced the quality and increased memory consolidation in people.

**Keywords:** *Qai'lullah*, Circadian rhythm, neurocognitive function, light exposure, blue light, midday nap

## 1. Introduction

Sleep is a phenomenon occurs to every living creature on this earth. It is a gift from Allah Almighty as a sign of affection and consideration towards His creatures. Islam also consider sleep as a great sign of the Creator and ask His followers to explore this sign (Bahammam *et al.*, 2012). There is a verse in Quran says, "And among His signs is your sleep by night and day and your seeking of His bounty, verily in that are signs for those who hearken" (Surah Al-Rum:23). A person will experience two completely different world every single day; the conscious world and the realm of sleep, where no souls, spirit and intellects exist.

Inclining activities in industry (i.e., electronics, textiles and foods), services and trade have caused more sleep disorder in people. An increasing demand by community for society to operate 24/7 resulted to a quarter of workforce worldwide are working outside normal daytime of employment time. The nature of working time (morning, night and/or evening shift) implemented by this workplace contributes negatively to both occupational and health of the workers. (Mohd Shahril *et al.*, 2020). Predominantly, these effects are linked to sleeping disturbance, sleep loss, sleepiness and fatigue. Current emerging of covid-19 pandemic, working adults are increasingly working from home and students adapting with e-learning due to new normal, are widely exposed to blue light exhibit by the digital screens (such as laptops, computers and phones) (Du *et al.*, 2021). This high-energy light indirectly effects their sleep cycle and eyes in a continuous, long-term exposure. Healthcare workers, suffers from sleep disorder due to continuous of pandemic patients'

\*Corresponding author: [sitiamira@uthm.edu.my](mailto:sitiamira@uthm.edu.my)

2021 UTHM Publisher. All rights reserved.

[publisher.uthm.edu.my/ojs/index.php/jqsr](http://publisher.uthm.edu.my/ojs/index.php/jqsr)

admissions into the hospitals for treatments (Tsang *et al.*, 2021). If this concerns protracted, it can decrease quality of life, safety, health, work performance and efficiency (Mei & Chan, 2021; Mohd Shahril *et al.*, 2020).

It is a fact that human body require a rest and able to obtain full respite with a good sleep. The recommended sleep duration of an adults is approximately 8 hours which is considered as necessary and ‘naturally unavoidable’ activity especially during night. While less than 6 hours of sleep for four days and more consecutively may results in negative effect on physiological and cognitive performance, appetite’s interferences, metabolic and endocrine functions (Mei & Chan, 2021; Tumiran *et al.*, 2018). Scientists have found that brain, as the main coordinating master of our body eventually get tired during daytime. This is because, the compilation of data delivered to it throughout the day, leading to a reduction in performance effectiveness. All the information gathered and cell waves can be organized by relaxation of brain as well as to consolidate the information obtained during the day. Therefore, human body, mind and soul requires respite even though just a brief moment (Yusof *et al.*, 2014). Hence, a midday nap or also called as *qai’lullah* can act as an effective alternative fulfilling the body’s need in a brief moment while treating the sleep disorder in people. As research related to sleep becoming more interesting, scientists and scholars expanding their research into wider scopes including, importance of sleep, sleep hygiene, sleep related disorder, insomnia, dreams, position of sleep as well as effective sleep timing and period (Bahammam *et al.*, 2018).

## 2. Sleep in Islamic Insights

Linguistically, sleep in Arabic, *an-naum* (نوم) is synonym with word to lie down (*muttaji*), to be still (*ar-raqd*) and also sleepiness (*an-nu’as*). According to Al-Isfahani, sleep is “to soften the nerves of brain with moisture of oxygen to the brain”. Al-Kindi defined sleep as follows, “Sleep is to allow our soul to be used by all senses. If we do not feel, hear, see, taste, touch without any usual illness (causing it), we are in a normal state called sleep”. There is also another view of sleep, the unconscious state of our body where eyes are closed because of resting. In Latin, the word “*sammus*” refers to sleep which means recovery. Meanwhile, is scientific point of view, sleep is a subconscious state where application of sensorics or other stimulants can be used to awakened a person (Yusof *et al.*, 2014).

### 2.1. Types of Sleep based on the Quran

In the Quran, the term “sleep” is often described by several diverse terminology and interpretation as stated by Bahammam *et al.* (2012). There are 5 terms which illustrated the word ‘sleep’ where modern medicine describes them as stages of sleep while ancient people observed the variety of sleep states. Profound analysis of different type of sleep in the Quran reveals and reflects their level of sleep. The types of sleep in the Quran are including;

- **Sinah** (سنه): It is defined as slumber or dozing off for a short period. People is conscious to any prompt of environmental stimulant in this type of sleep and it is also corresponded with stage one of sleep identified by modern sleep science. The word *Sinah* is used in a verse in Qur’an describing Allah. “No slumber (*Sinah*) can seize Him nor sleep” (Al-Baqarah: 255). In the Quran, sleep indicates weakness manifestation and signals the body for a rest. Hence, this verse proven that The Al-Mighty does not sleep nor doze off while it is necessary for His creation such as mankind and animals (Bahammam & Gozal, 2012; Heidari, Norouzadeh, & Abbasi, 2014).
- **Nu’ass** (نعاس): This term appears twice in the Qur’an describing one of the sleep’s types. First, the verse in Surah Al-Anfal, “Remember when He recover you with slumber (*nu’ass*) as a security from him” (Al-Anfal: 11). In this verse, slumber (*nu’ass*) provided the feeling of security from fear and stress for His believers. Another verse says, “Then after the distress, He set down security upon you. Slumber (*nu’ass*) overtook a party of you” (Al-Imran: 154). The word *nu’ass* is described short nap by interpreters that may reflect a stage of sleep deeper than *sinah*. It is also called as the beginning of sleep, light sleep and relaxation. This type of sleep is synonymous with first and second stage of sleep (Heidari *et al.*, 2014).
- **Ru’qood** (رقود): As’hab Al-Kahfi in Qur’an describes the sleep of the People of the Cave. A story of seven young believers, where Allah directed them to seek refuge from prosecution in a cave and then He put them into sleep state for 309 years (lunar years). Their sleep is described by the following verse, “And you would have thought them awake, whereas they were asleep (*ru’qood*)” (Surah Al-Kahfi: 18). This word has various descriptions and the most appropriate interpretation of *ru’qood* based on this verse is “long period of sleep”.
- **Ho’joo** (هجو): In Arabic language, Hojoo means little sleep. Sleep at night is illustrated by this term. Pious believers who fear Allah are described in the Qur’an by the following verse, “They used to sleep but little by night (*ho’joo*) and the hours before dawn, they were (found) asking (Allah) for forgiveness” (Surah Al-Dzariyat: 17-18).
- **Su’baat** (سبات): Qur’an also describes human sleep as *su’baat* in one verse. “And we made you sleep (*su’baat*) as a thing for rest” (Surah Al-Naba’:9). The word *su’baat* is derived from Arabic word, *sabt* that means disconnecting. Thus, *su’baat* may describes an act which disconnecting or separating the surrounding environment during sleep or higher arousal threshold. We are commonly have a leisure and relaxation day from work and any weekday responsibilities on Saturday, in Arabic word يوم السبت. *Su’baat* is finely describe as the leisure in physical and psychological part of a sleeping human (Bahammam & Gozal, 2012; Heidari *et al.*, 2014).

## 2.2. *Qai'lullah*

*Qai'lullah* is a term in Islamic literature which describes the napping activity during midday (Bahammam *et al.*, 2012; Yusof *et al.*, 2014). It is also known as *Siesta* (Tumiran *et al.*, 2018). *Qai'lullah* is a well-established as Islamic practice and encouraged based on hadiths which described the Prophet practicing it. This action commonly implemented in warm weather countries. Midday napping is accepted by Islam to be done before or after lunch as well as after Friday prayer as practiced by the Prophet Muhammad (pbuh). As described in the hadiths, *qai'lullah* should take place at certain times, before noon or early in the afternoon. Indeed, it can also be done by lying down and resting. There is another practice that is highly encouraged by Islam, known as *Qiamullail* or *Tahajjud*, a waking up in the last third or another part of the night for worshipping activity. As these practices involves the loss of some sleep during the night, hence *qai'lullah* completes the sleep taken at night and indispensables in assisting one to perform daily activities during the day (Yusof *et al.*, 2014; Tumiran *et al.* 2018). In the book "*Misykatul Masabih*" state that:

“A short nap in the afternoon is not to looked down upon. The Prophet p.b.u.h has done the same. This can balance the strength of the body after performing night prayers.”

## 2.3. Effective Duration for *Qai'lullah*

Ones might think that taking a longer nap gains more benefits, but sometimes less is more. It is highly encouraged to limit our mid-day napping to 30 minutes or less. Numerous studies have been observed with variety of priority benefits. A study found that naps last between 10 to 30 minutes often the best beneficial (Foster, 2021; Tumiran *et al.*, 2018; Yusof *et al.*, 2014). Following a sleep deprivation period, 5-minutes nap results in very few advantages when compared to not napping at all. A number of instance gains can be shown in a 10-minutes mid-day nap by increasing the energy and cognitive function. The positive effects were due to the beginning activity of delta-wave or fixed accumulation of stage 2 sleep or total sleep.

According to Tumiran *et al.* in 2018, taking these 10 minutes short nap is the best and most effective siesta's duration. Besides that, the benefits of this period also last as long as 155 minutes. There is also 20 minutes nap which helps increasing vigor and mental performance, even though the benefits only be felt after 35 minutes or so afterwards the nap. The advantages last nearly as close as the 10 minutes nap despite the brief delay. It is also assisting in maintaining daytime vigilance level and act as the best post-lunch sleepiness countermeasures. Napping for 30 minutes on the other hands, is frequently associated with sluggishness and fatigue after the nap. This happens due to sleep inertia which is a feeling of grogginess felt after the nap. Instead of that, once benefits kick in such as maximized alertness, they last similar to the 10-minutes nap.

An afternoon nap around 15 to 20 minutes is already sufficient to re-energized and for a person to be healthy as concluded by sleep experts from Cornell University. Another researcher, Mr Donald Greeley views that nap is beneficial as long as it does not exceed 1 hour period and this point of view also being agreed by other experts such as the authors of *The Art of Napping at Work*, Dr. William A. Anthony and Camille W. Anthony (Yusof *et al.*, 2014). In some cases, longer naps can be more restorative for sleep deprivation, which tends for sleep inertia to occur because of the increasing of deep sleep. Hence, we would normally see people who naps for 45 minutes and longer eventually wake up in confusion and sluggish. It is undeniable that nap length is vary depending on each individual factors but, 10- and 30-minutes range appears to be the best period for most people. We are recommended to grasp the advantages of the post-lunch dip in energy and schedule our siesta from midmorning to midafternoon (12:00 pm to 2:00 pm or 2:00pm to 4:00 pm), but no later (Foster, 2021; Tumiran *et al.*, 2018; Sinrich & Mantua *et al.*, 2017).

## 3. Behaviors of the Sky Light

The sky is one of the attractive natural phenomena and scenery where a calm, soothing and peaceful feeling can be found just by sitting and observing them rise or set in the day. While looking at this scenery, how comes they emit variety of light colors comes into minds, although have the same sources of light, the sun. This is because, sunlight on a clear, smog-free day is natural and full-spectrum white light. This white light can be separated into different colors bands (blue, green, yellow, orange and red) corresponding to their wavelength. Individual's wavelengths of white light form a continuous color spectrum (King, 2020).

The colors of sky depend on what happened to the light, either being absorbed or scattered out in the atmosphere before it reaches into our eyes. In facts, some of the lights do not even reach out eyes. When a beam of light from the sun strikes a molecule at the atmosphere, a "scattering" occurs sending part of the light wavelengths into different directions. The scattering happens millions of times before the beam reaches into our eyes at sunset. Oxygen and nitrogen are two main molecules in the air. They are nano-sized and smaller than the incoming light wavelength. So, these molecules are preferentially scatter blue and purple colors as they are the shortest wavelengths. That is the reason why daytime or noon are blue in colors, because the sun was right overhead us.

During sunset, light travels in the atmosphere at much longer path than it did at noon. Most of the blue light has scattered out and leaving amount of oranges or reds light hits the East Coast during sunset (Fiegl, 2013). Throughout the day, blue lights keep working to increased one's ability to focus, enhance reaction times and elevate the mood. By the

time sunset arrives, we are slowing down as the blue light is fading away, losing the intensity and cues the feeling of warmth and relaxation (Hakimi, 2019). As shown on Fig. 1, the attractive colors of sky occur due to the scattering of light beam from the sun at the atmosphere.



Fig. 1 - Colors of the sky

#### 4. Interrelation of *Qai'lullah* on Mid-Day Light Exposure and Neurocognitive Function

##### 4.1. Neurosciences of Human Body

Suprachiasmatic nucleus (SCN), a group of cells in the brain is the place where our body clock is located. As shown in Fig. 2, our eyes will detect the surrounding light illumination, transfer them and received by the SCN. There are photoreceptor and cones in the retina of the eye that are used for conventional vision. In the retina, there is also a specialized photosensitive ganglion cells which helps in synchronizing our body clock by directly project the light to the SCN. Later, the SCN takes from the retina, information including the light level and their duration and passes it to the pineal gland. The pineal gland is responsible for the melatonin (sleep hormone) secretion. Light is used to determine the timing appropriate for hormones releasing and signals the brain either wake up or sleep.

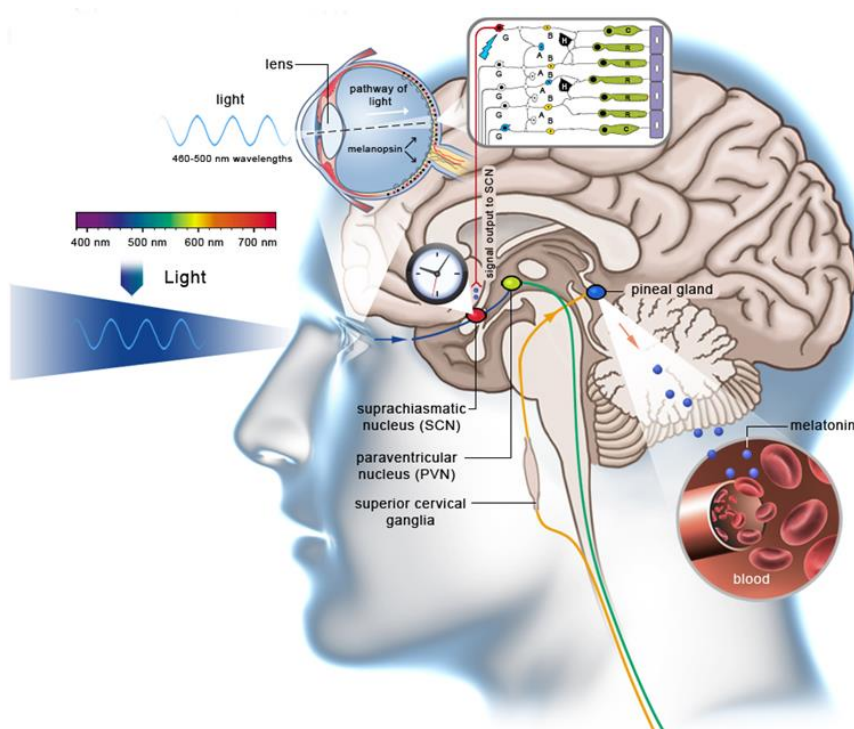


Fig. 2 - Illustration of human circadian rhythm

## 4.2. Blue Light Exposure

Light emitted from the sun during mid-day, where the sun is overhead, is brighter light with higher blue and UV content as there is less filtering at the atmosphere. Blue light is the high energy visible light (HEV), a description that also covers the ultraviolet (UV) rays. There are three subgroups of blue light spectrum; violet light (roughly 380-410 nm), blue-violet light (410-455 nm) and blue-turquoise light (455-500 nm). As it has high energy levels, this part of visible light has more potential causing harm to our body health, skin and eyes. The high energy of 380-455 nm light rays is more likely to damage the eye. For this reason, the violet and blue-violet rays are also known as “harmful blue light”. But not the entire blue light spectrum is hazardous. Blue-turquoise light rays on the other hand, is known as “beneficial blue light” because they have low energy and appear to help maintain a healthy sleep cycle (Coats, Maktabi, & Baki, 2020; Yusof *et al.*, 2014).

In this modern life, the sources of blue light not only come from the Sun, but also the digital screens (such as smartphones, laptops, computers, TVs and tablets), electronics devices, fluorescent and light emitting diodes (LEDs). This type of blue light or HEV, flickers more easily in comparison to longer, weaker wavelength. The flickers eventually reducing our visual contrast and affect the sharpness and clarity by creating glares. Discomfort of eye, headaches, physical and mental fatigue caused by hours sitting in front of digital screens may be due to these flickering and glaring (Lin *et al.*, 2016). It does not just effect adults, but also children and teenagers with the distinctive rise of e-learning results from spreading of pandemic Covid-19 viruses (Li *et al.*, 2020). So, a short nap in the mid-afternoon helps to boost memory, lift our mood, improve job performance and alertness (DerSarkissian, 2020; Kurdziel *et al.*, 2013).

Blue light generates reactive oxygen species (ROS) similar to UV radiation. This long wavelength and short-energy light induced cellular dysfunction and damaged the skin (Coats *et al.*, 2020; Lin *et al.*, 2016) as it penetrates deeper into the skin (compared to UV). Irradiation of blue light on human skins, decreased the carotenoids and suggests formation of free radicals. Flavins (pigment in skin), are the main blue light’s photosensitizers causing oxidative stress. Oxidative stress on melanogenic precursor is believed lead to pigmentation; immediate or long-term darkening. Some adverse effects of ROS overexposure to skin outcome issues of hyperpigmentation, melasma and aging. Even though there are evidences that blue light impact negatively on the hyperpigmentation development, electronics use does not seem to exacerbate this situation.

A study proves that melasma lesions did not worsen with the use of digital screen for 8 hours/day for 5 days at approximately 8-inch distance between them. Exposure of blue light can be both harmful and beneficial. It is associated in clinical and medical field for therapeutic treatment as stand-alone treatment or part of photodynamic therapy (PDT). In addition, the blue light’s wavelength and intensity employed in clinical practices vary depending on the purposes and type of treatment required. Past studies also shown that blue light is important in setting circadian rhythms (Lin *et al.*, 2016). It is expected that the slow but continuous harmful effect accumulated throughout the years regardless the exposure of blue light from the Sun is low intensity. Consumers of blue light emitting devices such as smartphones, TVs and laptops on their daily activities, may wonder whether the level of exposure by these devices is equally harmful to skin as the Sun is. The comparison of blue light intensities among these electronics devices and sun are studied and the authors concluded that the Sun emits significantly higher blue light that the others devices. This study proven the substantially minimal exposure to daily midday light (Coats *et al.*, 2020).

Besides that, our body’s level of stress hormones may also increase, disturb out circadian rhythm or sleep pattern and over-stimulate nerves. It is also stated that, 64% of surveyed person were unaware of the effect holds by these blue rays on their skin and health (King, 2020). Therefore, in order to avoid direct exposure of blue light particularly during mid-day, the best precaution can apply is taking a shade from the sun. Normally, mid-day is a period of rest and some of the company or premises closed temporarily for 1 to 2 hours specifically during working days. Hence, workers and students could take the benefits from this practice, for them to regain their energy and focus at the same time reduce exposure to blue light sources. Furthermore, it provides physiological and psychological benefits to the workers (Yusof *et al.*, 2014).

## 4.3. Improved Neurocognitive Performance and Sleep-Quality Booster

Scientifically, *qai'lullah* provides great benefits and it have been acknowledged by scientists around the world. Practicing mid-day nap or *qai'lullah* in our daily schedule will act as high sleep-quality booster. This is supported from a study by Ji *et al.* (2017) which reported, there is significantly lower scores of nighttime sleep quality by frequent nappers based on the post hoc tests, which reflected better sleep quality compared with moderate-frequency and non-habitual napping groups. A group of adolescents with long naps presented significantly better quality of nighttime sleep, in comparison to those who are not a mid-day’s shuteye. Furthermore, early adolescents with more frequent or longer midday napping reported less daytime sleepiness and longer nighttime sleep on average.

Habitual napping also relates with a wide spectrum of neurocognitive function in early adolescents. Frequent nappers (5-7d/week) tended to show an increasing likelihood of accuracy of sustained attention and nonverbal reasoning, that was independent of self-reported sleep duration and nighttime quality compared with non-habitual nappers (<3d/week) and moderate habitual-nappers (3-4d/week). Additionally, frequent mid-day shuteyes were significantly connected with faster speed of reaction on the task assessing spatial memory than moderate habitual-nappers. There is also domain-specific

relation between nap period and task performance for sustained attention. It was observed that participants with any nap duration shows particularly faster reaction speed compared those who never napped. Nevertheless, only individual with moderate naps duration proven increase in both accuracy and attention task's speed (Ji *et al.*, 2017). A study conducted over a period of 25 years shows a result related to the sleep effect in industrial and post-industrial countries. From the results, they indicate that 95% of worker having the opportunity to nap in the afternoon had higher creativity levels compared to those who did not. Their solving problem's ability also improved, simultaneously enhance their overall productivity (Yusof *et al.*, 2014).

Besides that, napping also seemed to be more beneficial throughout early life by consolidating procedural memory. Following the nap session, children recalled 10% of the spatial locations in comparison to if they have been kept awake (Tumiran *et al.*, 2018). It is also observed that factors such as trait-like differences in sleep demands and sleep ability, complex chronobiological sleep regulation interaction, culture beliefs and environmental also mainly effect the napping behaviors of an individual. This is because, there are study reported a trend of Chinese people towards longer sleep duration and better quality of sleep with increased mid-day napping length (Ji *et al.*, 2017). While on the other findings by American adolescent samples show contradiction with the previous research stated (Jakubowski *et al.*, 2017).

## 5. Conclusion

*Qai'lullah* is proven to have a good potential for improving our daily activities performance. Our daily exposure to blue light either from the sun or digital screens results in an eyestrain, headaches, mental and physical fatigues due to the glaring and flickering creates by this high energy light. It is also easily penetrating deep into the skin and contributed to various health and skin damages for excessive or long-term exposure. At this point, *qai'lullah* as a powerful and effective practice, can cope with these problems and refresh human's strength and productivity. Furthermore, neurosciences advocates *qai'lullah* as it improves our memory consolidation, re-energized and rejuvenated our body and minds, vigilance performances, enhanced neurocognitive functions and alertness. Appropriates length and timing of nap as well as position of sleep itself should be considered to achieve the best outcomes which led to abundant of positive results for our physical, biological and mental powers. A siesta in an early afternoon has appeal of productivity, nevertheless, it does not a replacement of night sleep. A deep night sleep is inevitably predominant as it fulfills most of our biological functions particularly the brain and the whole-body parts.

## Acknowledgement

Authors would like to thank Universiti Tun Hussein Onn Malaysia that make the research possible.

## References

- Bahammam, A. S., & Gozal, D. (2012). Qur'anic insights into sleep. *Nature and Science of Sleep*, 4(May 2014), 81–87. <https://doi.org/10.2147/NSS.S34630>
- Tumiran, M. A., Rahman, N. N. A., Saat, R. M., Kabir, N., Zulkifli, M. Y., & Adli, D. S. H. (2018). The Concept of Qailulah (Midday Napping) from Neuroscientific and Islamic Perspectives. *Journal of Religion and Health*, 57(4), 1363–1375. <https://doi.org/10.1007/s10943-015-0093-7>
- Foster, K. 2021. Our Guide to Sleeping During the Day [Online]. Accessed June 16, 2021 from <https://www.sleep.org/sleeping-during-the-day/>
- Slama, H., Deliens, G., Schmitz, R., Peigneux, P., & Leproult, R. (2015). Afternoon nap and bright light exposure improve cognitive flexibility post lunch. *PLoS ONE*, 10(5), 1–16. <https://doi.org/10.1371/journal.pone.0125359>
- Mantua, J., & Spencer, R. M. C. (2017). Exploring the nap paradox: are mid-day sleep bouts a friend or foe? *Sleep Medicine*, 37(413), 88–97. <https://doi.org/10.1016/j.sleep.2017.01.019>
- Sinrich, J. 2017. How to take a nap that will actually boost your energy [Online]. Accessed June 17, 2021 from <https://www.nbcnews.com/better/health/how-take-nap-will-actually-boost-your-energy-ncna793681>
- Connected Light. 2015. Lighting & Human Biological Behaviour [Online]. Accessed June 17, 2021 from <https://connectedlight.co.uk/lighting-human-biological-behaviour>
- King, E. 2020. Blue light exposure 'similar to midday sun', study says [Online]. Accessed June 18, 2021 from <https://retailbeauty.com.au/blue-light-exposure-similar-to-midday-sun-study-says/>
- Heiting, G. 2019. Blue Light Facts: Is Blue Light Bad for Your Eyes? [Online]. Accessed June 18, 2021 from <https://www.allaboutvision.com/cvs/blue-light.htm>
- Xiaopeng Ji, Junxin Li, J. L. (2017). The Relationship between Midday Napping and Neurocognitive Function in Early Adolescents. *Physiology & Behavior*, 176(1), 139–148. <https://doi.org/10.1080/15402002.2018.1425868>.
- Jakubowski, K. P., Hall, M. H., Lee, L., & Matthews, K. A. (2017). Temporal relationships between napping and nocturnal sleep in healthy adolescents. *Behavioral Sleep Medicine*, 15(4), 257–269. <https://doi.org/10.1080/15402002.2015.1126595>
- Fiegl, A. 2013. Red Sky at Night: The Science of Sunsets [Online]. Accessed June 19, 2021 from <https://www.nationalgeographic.com/science/article/131027-sunset-sky-change-color-red-clouds-science>

- Yusof, F. M., Muhamad, S. N., Rosman, A. S., Ahmad, S. N., Razak, N. F., Hashim, N. I., & Awang, A. (2014). Sleep phenomena from the perspectives of Islam and science. *Jurnal Teknologi (Sciences and Engineering)*, 67(1), 105–110. <https://doi.org/10.11113/jt.v67.1687>
- Hakimi, D, P. 2019. The Effects of Light Color and Intensity on Your Mind and Body [Online]. Accessed June 20, 2021 from <https://www.alconlighting.com/blog/lighting-design/effects-of-light-color-intensity-mind-body/>
- Bahammam, A. S., & Almeneessier, A. (2018). Medieval Islamic Scholarship and Writings on Sleep and Dreams. *Annals of Thoracic Medicine*, 13(2), 72–75. <https://doi.org/10.4103/atm.ATM>
- Heidari, M. R., Norouzadeh, R., & Abbasi, M. (2014). Sleep in the Quran and health sciences. *Health Spiritual Medical Ethics*, 1(1), 30–36. Retrieved from <http://jhsme.muq.ac.ir/article-1-44-en.html>
- Li, Cathy., & Lalani, F. (2020). The COVID-19 pandemic has changed education forever. This is how. Retrieved from WORLD ECONOMIC FORUM website: <https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/>
- DerSarkissian, C. (2020). Health Benefits of Napping. Retrieved August 23, 2021, from webMD website: <https://www.webmd.com/a-to-z-guides/ss/slideshow-health-benefits-of-napping>
- Lin, J. B., Gerratt, B. W., Bassi, C. J., & Apte, R. S. (2016). Short-Wavelength Light-Blocking Eyeglasses Attenuate Symptoms of Eye Fatigue. *Investigative Ophthalmology & Visual Science*, (58), 442–447. <https://doi.org/10.1167/iovs.16-20663>
- Mohd Shahril, AH; Mohamad Ezuan, A. N. I. (2020). SLEEPINESS AND DAILY SLEEP OF MALAYSIAN SHIFT WORKERS IN ELECTRONICS MANUFACTURING INDUSTRY. *Malaysian Journal of Public Health Medicine, Special 1*, 208–215. <https://doi.org/https://doi.org/10.37268/mjphm/vol.20/no.Special1/art.702>
- Du, C., Chong, M., Zan, H., Cho, M. J., Fenton, J. I., Hsiao, P. Y., Tucker, R. M. (2021). Health Behaviors of Higher Education Students from 7 Countries: Poorer Sleep Quality during the COVID-19 Pandemic Predicts Higher Dietary Risk. *Clocks & Sleep*, 3, 12–30. <https://doi.org/https://doi.org/10.3390/clockssleep3010002>
- Mei, C., & Chan, H. (2021). Prevalence of Insufficient Sleep and Its Associated Factors Among Working Adults in Malaysia. *Nature and Science of Sleep*, (13), 1109–1116. <https://doi.org/https://doi.org/10.2147/NSS.S295537>
- Tsang, H. W. H., Grif, M. D., Alimoradi, Z., Brostr, A., Haghayegh, S., Ohayon, M. M., ... Pakpour, A. H. (2021). Sleep problems during COVID-19 pandemic and its ' association to psychological distress : A systematic review and meta-analysis. *EClinicalMedicine*, 36. <https://doi.org/10.1016/j.eclinm.2021.100916>
- Kurdziel, L., Duclos, K., & Spencer, R. M. C. (2013). *Sleep spindles in midday naps enhance learning in preschool children*. 110(43), 17267–17272. <https://doi.org/10.1073/pnas.1306418110>