

Deliberation of aesthetic aspects of illumination by daylight with environmental psychology approach

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Abstract

An integral part of any interior design is lighting. Removing the curtains in the early hours of the morning and inviting the light to broaden the house as much as possible can be one of the things we do without previous study and specific information. This means that we accept the importance of daylight in the interior design in the form of a self-evident principle. In this research, we tried to clarify the psychological and aesthetic significance of daylight in our lives; and this is something that is forgotten in the interior design of residences nowadays. In other word, we have a dilemma; profitable construction or human mental health? Unfortunately, the importance of interior design is still obscuring for many people, and the prevailing view of people is that the interior design is an extra layer; and there is unfortunate that the illumination especially the daylight, which is associated with the human mental health, is neglected. We tried to clarify this important position by describing the effects of daylight on the nervous system and up and down levels of serotonin and melatonin hormones which is very influential in controlling the 24-hour body's rhythm, eliminating depression and mental problems. Nowadays, In addition to the old daylight systems that mainly consist of windows, there are some advanced systems that are progressing to get the most out of daylight and reduce artificial light by daylight sensor. We also have tried to explain these sensors which measure the incoming light and sends it to the control unit to get the brightness or dimming command.

Keywords: interior design, daylight, mental health, daylight systems, aesthetic significance

Introduction

Can you imagine solitary confinement of a prison? The first thing that comes to the mind when thinking about jail is that there are no openings to the courtyard. Darkness even in the day. After a while, they will look depressed. Indeed, light has a pure nature, like a baby; and perhaps because of this pure and innocent nature, the child's look is fascinated by the brightness, and even when it moves, it follows the beams of light. With these two simple examples, we can think about illumination philosophy. All the creatures of all around the world came from the light and their light shines at each other. This is philosophy and wisdom of Ishraq from sheikh Ishraq, Shahab al-Din Yahya ibn Habash Suhrawardi. In other word, in his philosophy of illumination, the light is a divine and metaphysical source of science (Contributors, 2017). The place of residence is to be the place of relaxation and the return of the soul. Even if the fact that the house is not just one place but space is not implemented in practice, this fact cannot be passed. A house is not only made of ceilings, floors, and walls, as today where they are more like shelter (Alexander, 1979). So where is the sense of place?

There are still many people who consider beauty as a shell of decorations. Carlo Volf in his article implied the effect of interaction between artificial light and daylight for deeply understanding aesthetic; and quotes from Gernet Boehme that light is a routine aesthetic which is the background of our life (Volf, 2011). Massive construction, despite the knowledge of interior architecture and decoration design factors, and on the other hand the taste and uses of its users, are condemned. Therefore, recognizing the position of light and lighting, especially daylight, in interior design is obligatory. From the environmental psychology point of view, the light that has the full spectrum also guarantees physical and mental health. Despite the light decorative aspects and the progressive lighting industry, the importance of daylight cannot be denied. The importance of the presence of daylight until the sky is clear has become a proven principle. Now if we deprive the eye of the full spectrum of light, we will space from judging the beauty of objects, detecting the boundaries of the space, and analyzing the data with a significant approximation (Edwards & Torcellini, 2002; Moscoso, 2016).

What was the daylight worry?

Light on the visual touch of the universe is an essential factor. In order to communicate with the physical environment, we first need to get a lot of information, such as the boundaries of the space, through vision.

Most daylight studies are used for photometric measurements to capture and describe the light. But in short, what matters to us in this paper is a good lighting that helps aesthetician to understand each environment. Although photometric studies are indispensable, they are by no means always predictors to judge the aesthetic features such as order, readability, spatial coherence, delight and spatial communication. Of course, the study of the relationship between daylight and environmental aesthetics is still a beginner's knowledge and superficiality, which is far more likely to be studied and thoughtful. Additionally, the perception of aesthetics of environments requires environmental psychology studies such as environmental aesthetics and measurement of perceptual perceptions. For this reason, the aesthetic quality of the present study is of the utmost importance (Moscoso, 2016; Volf, 2011).

Capitolians are well aware that today's life in small apartments is not sufficiently exploitable from the natural light. The small size of the apartments does not allow for the implementation of the mapping of all standards. Percentage of people living in the northern regions of the planet, and six scientists' research have shown that they do not have sufficient and long-lasting sunlight, suffer from emotional distress like depression and have shown that the changes in light radiation that occur as the result of seasonal changes also affect people's morale. Therefore, the use of light, in particular, the natural light of day in the building, is of particular importance.

The pathway for receiving light beams by the eye and transferring to the nervous system

The light we observe, or because of what we see, moves along a straight line from the retina to the nerves and then to the pituitary and hypothalamus glands. This pathway extends into a cone-shaped gland (like pine

tree fruit) secreting the serotonin hormone (Edwards & Torcellini, 2002). Serotonin is a neurotransmitter. Serotonin levels are associated with an increase in carbohydrate tendency, depression, pain sensitivity, and harmful sleep patterns. When serotonin levels of carbohydrate are high, sexual desire rises, pain tolerates, and sleep becomes more relaxed. The serotonin hormone controls sleep, it is effective in relieving pain and appetite, and is psychologically pacifying and improving the psychological aspects of humans. As normal exposure decreases, the serotonin is converted to melatonin. As normal exposure decreases, the serotonin is converted to melatonin. Melatonin controls the internal time of the body. Now, if there is not enough light throughout the day, the body's 24-hour body rhythm is affected. That is, a person suffers from insomnia and, as a result, anxiety, and depression. Thus, natural light can provide the required spectral energy for all of the biological functions mentioned in this article and many others that are not the subject of discussion (Edwards & Torcellini, 2002; Joarder, Price, & Mourshed, 2009).

Unlike serotonin, melatonin appears in the absence of light and produces serotonin. With increasing levels of melatonin, serotonin is usually reduced. When the daylight and artificial lighting are inappropriate inside the buildings, there will be no natural repression of melatonin production during the day. Instead of increasing the concentration of serotonin, melatonin increases, which is associated with the depression. The level of melatonin in the body determines the activity and level of energy of the individual. Low levels of melatonin are associated with a state of alertness and concentration, and in contrast to high levels, it can increase drowsiness (Edwards & Torcellini, 2002; Joarder et al., 2009).

It should be noted that these effects occur in people who do not have a visual impairment. Because vision has the task of receiving information, and if it is impaired, there is almost no possibility of transferring them to neural networks.

Effects of daylight on psychological health

Every spectrum of the light has special impacts on our body. Many studies show that light that has all the spectra is the most appropriate light for human mental and physiological health. This is due to the fact that each spectrum has its own effect on the body. Therefore, today the optimum and maximum use of daylight are emphasized. Even the most important uses of the natural light can bring the economic benefits that are not discussed in this article. What matters is the effect of light spectra on the health of human bodies, which can highlight the importance of lighting in interior design. Especially lighting with a light that has a full range of colors. In a research by NREL, quoted from Dr. Liberman (1994), it is also mentioned that the light plays a role in maintaining health: "When we speak about health, balance, and physiological regulation, we are referring to the function of the body's major health keepers; the nervous system and the endocrine system. These major control centers of the body are directly stimulated and regulated by the light, to an extent far beyond what modern science has been willing to accept." (Edwards & Torcellini, 2002)

If you even have a superficial study of yoga exercise, you're likely to have encountered the chakra word. The chakra in the Sanskrit language means the wheel. Chakras are in fact centers of energy rotation. The human body has seven main chakras that are involved with the seven major glands of the body, each of which is involved with a network of nerves. In other words, chakras are energy plants in the human body that, if they are not properly activated, the organs involved and under the control of those gaps and tubers will suffer from weakness or disease. Each chakra is affected by a color spectrum from a full beam of light. And perhaps the other reason for the light of day, which has all the spectra, is the need for exactly all of these seven energy centers, exactly the seven color spectra that it owns ("A Beginner's Guide to the Chakras - Yoga Journal," 2001; Judith, 2012).

Treating SAD: Another daylight-driven psychological topic is a seasonal emotional disturbance, which occurs most of the fall and in rainy days, and it is eliminated in the summer due to light exposure. Also, morning light is more effective than evening light in eliminating sleepiness, depression, and anxiety caused by the disorder, which has doubled its research (Joarder et al., 2009).

Reduce Depression: Light is a day of anti-depression. For the same reason, it's about the secretion of serotonin hormone. Getting light through the eyes and transferring it to the part of the brain that is

responsible for controlling and maintaining the body's rhythm is helping to rest easy. This part of the brain is called the suprachiasmatic nucleus (SCN), which is located in the lateral part of the brain in the hypothalamus. If we go beyond research and studies, we will find that daylight even removes pregnancy depression in women, as well as depression and disorder caused by diseases like Alzheimer's (Joarder et al., 2009).

When the industry contributes to the optimal use of daylight in interior design: a summary of the harvesting daylight system

Today, there are two kinds of daylight design. The most elementary and the oldest way to use the daylight is the windows (Elemental Daylight Design). The next is the systems designed to collect daylight, which is referred to as advanced action (advanced daylight design).

Elemental Daylight Design: our desire is to get the natural light of the day from the main surfaces of the room; directly or reflectively. The emphasis on the importance of the daylight on the surface of the wall and the ceiling is not just the overall brightness of the room; it also contains information (“Siteco Beleuchtungstechnik GmbH: Daylight systems,” 2017). Here's a simple way to better reflect and get better information from the levels mentioned: using bright colors on walls and ceilings. According to a study (DETR), we found simple results in the form of a series of criteria for better daylight usage which we briefly refer to them (Tregernza, 2017):

1. When a window is used as the main source of lighting in an interior, the external obstacles facing it should not be higher than 25 degrees to the horizon of that window. (Tregernza, 2017)
2. A room, provided that one-twenty-five of its total surfaces are polished and reflective, can be a manifestation of the whole view of the day. (Tregernza, 2017)
3. Those parts of the room that you do not see the sky have the least amount of daylight that must be compensated by artificial lighting. (Tregernza, 2017)
4. It is better to consider regions closer to windows for activities that need daylight more (Tregernza, 2017)

Advanced daylight design: in this way, sensors are installed in certain locations that, when it enters the light, it directs light and modifies and reduces the electrical light. Lowering artificial light depends on the amount of daylight entering and its trapping. Daylight harvesting system dims electric lights or switches them off during the day to take advantage of the available sunlight. There is a device that reads the light and sends the signal to the control system. It also has a daylight-signaling system that sends control to the system after collecting it. There are 3 types for the advanced daylighting system (Lutron, 2017):

1. Switched daylighting: in this type of daylighting systems when interior space meets minimum adequate daylight, electric lights are turned off. (Lutron, 2017)
2. Bi-level daylighting: this type is similar to the previous kind. With the difference that at least 50% of the brightness level is considered and there is no complete extinction for loads. As daylight enters space, the loads are reduced from 100% to 50% (at least 50% is considered). It is a way for avoiding having an over-lit space. (Lutron, 2017)
3. Continuous daylighting: for preserving the minimum level of daylighting it is moderate dimming from low to high. It controls illuminations according to the average daylights are in the space. (Lutron, 2017)

Conclusion

Research has shown that approximately 60 percent of the neural signals that connect the sensory organs to the brain is in the eye. And so it is not too far from the mind that human senses have the power to receive more information and analysis, and therefore, it is not far from the mind to give the best conditions for receiving and analyzing information. There are a lot of resources that can be found to provide more strong reasons to prove that each one has its own approach. The approach was more psychological. While this importance can be found even in economic, environmental and therapeutic approaches. Unfortunately, we attend to physical problems in our body maybe because of sensing their pain. While mental problems,

depression, and the collapse of the night-time rhythm are distressing subjects, they have an invisible and Non-tangible source.

For example, anyone who has experienced a jet lag phenomenon is familiar with the issue of breaking the rest of the body. Long journeys to destinations with high time difference compared to the source of sleep interrupt for a few days, which is associated with bad sleep and folds. In addition, many people, including Alzheimer's patients, are constantly harassing them and exacerbating their depression.

Therefore, we, architects, and in particular interior architects who are aware of the importance of the psychological approach in lighting, must try with the help of industrial design to upgrade the elementary and advanced daylight systems to make the best use of daylight as much as possible and beside it Electric lighting is a complementary option.

References

- A Beginner's Guide to the Chakras - Yoga Journal. (2001). Retrieved October 22, 2017, from <https://www.yogajournal.com/practice/beginners-guide-chakras>
- Alexander, C. (1979). *The timeless way of building* (Vol. 1). New York: Oxford University Press.
- Contributors, W. (2017). Illuminationism. Retrieved October 22, 2017, from <https://en.wikipedia.org/w/index.php?title=Illuminationism&oldid=786914307>
- Edwards, L., & Torcellini, P. (2002). *Literature Review of the Effects of Natural Light on Building Occupants*. National Renewable Energy Lab., Golden, CO.(US).
- Joarder, M. A. R., Price, A. D. F., & Mourshed, M. (2009). Systematic study of the therapeutic impact of daylight associated with clinical recovery.
- Judith, A. (2012). *Wheels of life: A user's guide to the chakra system*. Llewellyn Worldwide.
- Lutron, D. J. (2017). Daylight Sensor Design and Application Guide. Retrieved from http://www.lutron.com/TechnicalDocumentLibrary/3683587_Daylight_Sensor_Design_and_App_Guide_sg.pdf
- Moscato, C. P. (2016). Daylighting and Architectural Quality: Aesthetic Perception of Daylit Indoor Environments. Siteco Beleuchtungstechnik GmbH: Daylight systems. (2017). Retrieved October 22, 2017, from <http://www.siteco.com/en/products/daylight-systems.html>
- Tregenza, P. (2017). Desktop Guide to Daylighting-for Architects, Good Practice. *DETR Good Practice Guide*, 245.
- Volf, C. (2011). Light and the Aesthetics of Perception. *The Nordic Journal of Aesthetics*, 22(40–41).