

Role of lighting in built forms with reference to meditation resort

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ABSTRACT

Light has perpetually been a predominant component within the activities of humans. Various efforts are fashioned to style buildings that use a good proportion of natural light, in both the developed and therefore the developing countries. Monumental amounts of cash, which just about surpasses the value of a building, are accustomed to the light areas in buildings. On the opposite hand, meditation plays a vital role in modelling associate an individual's mind and body that is the psychological and physiological aspects of a person's life. Mediation ensued as a voluntary cooperative procedure where people having a conflict with each other establish problems, develop choices, mull over alternatives, and develop an accordant contract. Trained mediators facilitate open communication to resolve dissimilarities during a non-adversarial, confidential fashion. Aside from trainers, lighting conjointly plays a vital role to assist in the accomplishment of a similar agenda. The study exhibits the necessity for daylighting schemes to be a remnant of the planning procedure, specifying that they will be used to conclude the probabilities of providing for passive solar profit or plan to minimize solar and interior loads with relevant daylighting procedures.

Keywords: *Lighting in Meditation, Daylighting Techniques, Physiological and Psychological Effects.*

A meditation area style involves a procedure which may be satisfying and eminently pleasant. The character and atmosphere of the locale to that we tend to be appealed to make it thus tremendously diverse once time and vitality are placed into the production of a quality zone to meditate. A warm and intriguing positive atmosphere is enticing for the attendees to create a much easier environment to sit back and relax alongside entering into the precise outlook for meditation. Ideally, meditation area ought to be a peaceful area that is free from any mess and litter and is quiet. A style theme that reflects a unique temperament, and an environment that enriches one's mood ought to be existent. Meditation rooms ought to be comfortable, not solely in terms of furnishings, however conjointly providing associate applicable condition and lighting, as they play a vitally important role in modelling the psychological side of the attendees. Colour and light group synchronically with one another in numerous ways in which, wholly influencing the style within which we tend to understand the area around us. For instance, a space painted in warm colours could seem cold if the inappropriate sort of lighting is serviced. Furthermore,

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Received: June 23, 2020; Revision Received: August 02, 2020; Accepted: September 25, 2020

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the approach colour and light combination could affect the manner of perceiving the scale. A bright area could feel darker in the absence of light or sunshine whereas an excessive amount of light can wash out the space colours.

Importance of Lighting in Meditation

The physical structure of humans have seven chakras or alleged nodes amongst that Sahasrara or crown chakra is at the upmost and is taken into account to be of the highest spiritual centre and therefore the state of pure consciousness is required in meditation for correct alignment of different chakras. Setting the aura for meditation is very important in having the ability to target the mind and on oneself, distant from physical aberration and choosing natural lighting is one amongst suggested means to effectuate the same. The command over light is vital. For instance, openings in a meditation area would possibly require blinds, curtains and diffusing glass. Overhead lights with dimming display can enable to possess entire command over the light levels. Complete darkness is not acclaimed. Warm lighting is the paramount selection for a meditation area. Fluorescent light is to be eluded being the coldest. Lamps are an outstanding method to add additional composed lighting selections to a meditation space and highlighting of one part of the space offers the correct aura. Salt crystal lamps are a classy preference for meditation areas these days, however, are rarely the sole selection, candles in coloured glass containers to cast a vivacious glow can even be used. Cover screens are used for incorporation of subtle lighting within the meditation area to certify a state of consciousness.

Study of effects of natural light on human health

Light is characterized into 2 shades, one being natural: created by sun whereas the opposite is artificial light originating from associate electronic source or device. Natural light has various aesthetic and health aids. For instance, consultants at the Lighting analysis Centre (LRC), in Troy, N.Y., have declared that day-lit surroundings heighten denizen adaptability and satisfaction, and cater to the intellectual and visual stimulation necessary to balance human circadian rhythms.

The biological time (means roughly a day) is critically crucial to our health because it has effects on our immune structure, capability to repulse unwellness, hunger and corpulence, blood pressure, and cognition. It controls our sleep-wake cycle thus is very vital for brain performance and body regulation and applicable functioning of it, a synchronized mental and physical health is needed which may be accomplished by meditation.

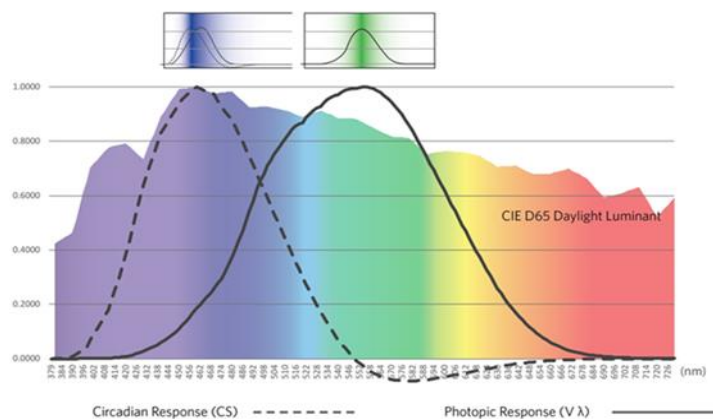


Figure No. 1 Spectral variance of receptors

Source: <http://www.metropolismag.com/interiors/healthcare-interiors/why-light-matters-designing-with-circadian-health-in-mind/>

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Study of physiological and mental needs in illuminance aspect

According to studies conducted worldwide, emotion demonstrates itself in 3 distinct sections-

Physiological (i.e. objective criteria), Psychological (i.e. subjective criteria), Behavioural.

1. There exists a nearby correlation amongst emotions, vital sign like heart rate (HR) and skin conductance (SC). Henceforth HR and SC are anticipated to be sensible physiological measures of ecological conditions on individuals.
2. Illumination Engineering Society of North America (IES) summaries that lighting can play a vital half in reinforcing distinct perception, activity and mood setting.
3. Light ought to yield a mood and atmosphere in an area, that corresponds to people's request and expectation.
4. Changes within the concentration of a light supply can even revise the sensory activity mood of an area.
5. Light associated colour unquestionably affect body functions even as they exert an influence on top of thus known as awareness and feeling.
6. Psychological result of lighting
7. For the rationale that the sense of sight is distinction sensitive, the brightness distinction of an area governs its emotional impact (separate imitations of an area are a function of brightness contrast).
8. The relationship of facades that are lit to those left within the dark
9. The emphasis or foreground to the surrounding or background.
10. Overall illumination in a part of the building can allow vision. The emotional influence of an enclosed area through the manipulation of brightness distinction is an actual challenge for the inventive lighting designer.

Daylighting principles and strategies

1. Lighting monitors six elementary principles like,
2. Elusion of direct penetration of daylight.
3. Consistency of sunshine throughout the area.
4. Elusion of glare
5. Organization of command of daylight by louvres, diffusion screens, etc.
6. Electrical lighting structure and daylighting designed to be complimenting one another.
7. Planned interior areas with daylighting style organisation.
8. The overhead nominative elementary principles may be reformulated allowing to coming up with designed forms as specific rules for the planning –
9. Window dimension in width is between one-fifth and one-quarter of the depth of the area,
10. The window height is nearly twice and one-sixth the window dimension in width.
11. These rules may be extended into additional familiar forms:
12. Maximum area depth is four to five times the elevation of the window,
13. Window space is roughly one-tenth of the sq. of the space depth.
14. From the instances delivered by Palladio, it seems that his favoured window to floor space is of the order of one-fourth and his window to window wall quantitative relation is almost seven-twentieth.
15. most area depth is 2-2.5 times window head height for uninterrupted fenestration and curtain wall construction wherever window heads square measure close to the ceiling (Kaufmann, 1975)

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16. area depth is 2.5 times window head height for continuous or close to continuous windows to a lower place overcast skies and 3-3.5 times to a lower place below transparent sky (AIA, 1982),
17. twice for uninterrupted clear glazed and curtain walling (Rea, 1993),
18. 2.5 with a daylight factor of one-fiftieth (Standards Australia, 1994),
19. 1.5 or 2.5 times with a south fronting light shelf (O'Connor, 1997),
20. 1.5 times for work, 2.5 times for owner-occupied areas (Schiller, 1992).

METHODOLOGY

Analysis of effects of lighting on the meditation performance

The effects of lighting can vary from physiological, psychological, behavioural to effect on an individual's mood and to understand the effects of the same separately as well as in accordance with the others an analysis was done.

After a survey conducted on 5432 candidates from different age groups including elderly, working class and undergrad and postgrad students from different fields a thorough study of their behaviour with respect to their individual lighting response and mood was done. The survey focused on the type of lighting preferred by the individuals, percentage of daylighting favoured and available in the meditation room and in their day to day activities and ways of incorporating the lighting in meditation rooms by them.

As per the survey, 70% of the candidates preferred daylighting whereas only 6% were up for artificial lighting and 24% favoured a balanced ratio of both daylighting and artificial lighting in their meditation surrounding. Amongst the 5432 candidates, 92% agreed that the type of lighting present in meditation room affected their mood.

Day-lighting being one of the ways of body clock resetting, the percentage of the candidates' daily activities involving day-lighting astonishingly varied.

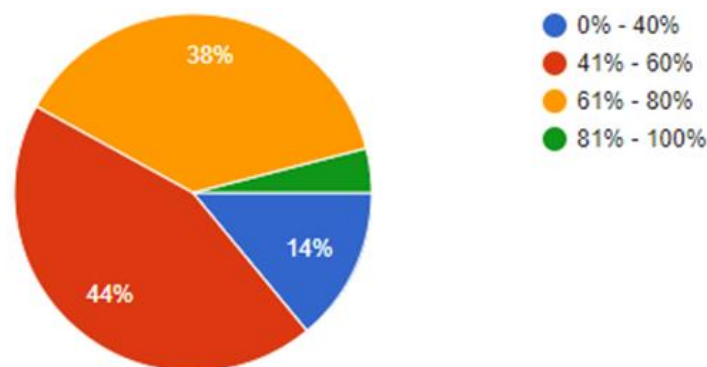


Figure No. 2 Daylighting preference according to different practices

The preferred daylighting practices by 50% of the candidates in their idle meditation rooms was daylighting with blinds, curtains and shutters whereas 20% of them preferred direct daylighting and 30% favoured point source daylighting with dimmer option, but upon further survey, 26% of these candidates preferred below 40% of daylighting in their meditation room, 40% favoured daylighting between 40% to 60%, 32% of them chose 60% to 80% and 2% favoured open air or 80% to 100% of daylighting for the same.

The survey also focused on the type and colour of lighting favoured by the candidates during meditation of which 52% of the individuals preferred warm light colours, 16% preferred the dim lighting in shades of yellow or orange favouring the warm colours whereas 32% were

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up for cold colours including shades of blue and green but, whatever be the choice of the lighting colour 88% of the individuals agreed upon the fact that day-lit meditation can be counted as a way of stress reliever whereas 12% were stuck with a maybe.

Daylighting can help in physiological well-being and can aid in the meditation process when used properly with professional help and all of the candidates preferred to use daylighting to do the same for them. There are different factors of meditation which can enhance the psychological well-being of the users depending upon their individual preference.

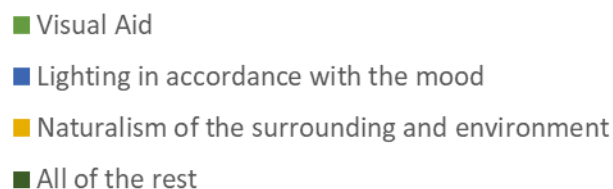


Figure No. 3 Factors affecting meditation

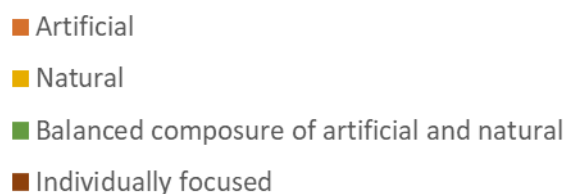


Figure No. 4 Nature of the mediation environment

Natural light plays a vital role in the symphony of our senses and the same can be applicable on health as well according to 98% of the participating candidates. The compatibility of the candidates with different wattage of light during meditation varied from 48% of candidates choosing low wattage white light, 22% choosing low wattage yellow light, 18% choosing low wattage blue light, 2% favouring low wattage red light and 8% favouring high wattage

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white light from a varied range of coloured lights and their wattages, resulting warm colours being favoured more than cold colours. Similarly, 58% of these candidates preferred low wattage warm colours for a calm heart rate, a factor directly affecting the physiology of any individual, 2% preferred high wattage warm colour for the same, whereas, 38% of the candidates chose low wattage cold colours and 2% favoured high wattage cold colours, ultimately resulting in warm colours being the most favoured.

Contrasting composure of light and shadow in the built form using natural elements create physiological and psychological impact on the users; 96% of the survey candidates agreed upon this statement whereas 4% did not.

When given a choice between green self-actualization pockets with point source lighting, as previously chosen by 20% of the candidates for their idle meditation room, and common rooftop sky-lit meditation rooms, previously chosen by only 2% of the candidates for the same, surprisingly 80% of the candidates chose green self-actualization pockets with point source lighting which was to the point opposite to their previous response. Further, 96% of the candidates agreed that a well day-lit meditation resort will suffice for a vacation spot.

Final results of the survey indicate that be it an elderly, working person or a student of undergrad or postgrad prefers daylighting over artificial lighting for their meditation room and the colour of the lighting in the rooms has to be warm for calm heart rates, skin conductance, healthy environment and psychological well-being but above all this, natural surroundings is preferred.

The candidates also provided personal suggestions in terms of lighting and surroundings for their meditation rooms and resort, amongst which few were to incorporate daylighting in a diffused manner in a serene environment with a visual connection with the natural elements of the surroundings, naturally lighting the meditation room with not too harsh light but also having natural elements as a part of the mediation room and open terraces having the rigid formation with both the hard and soft landscaping and having a connection with the flowy nature of the water element to compensate with the rigidity and provide for a proper balance of the meditation environment.

The survey also produced the result that lighting can enhance ones thinking process and thoughts as well the mood of the individual and can even help the individual physiologically and psychologically evolve. Lighting can be used as a technique to help mediation and the ones meditating in need of mental and spiritual calmness.

METHODS OF LIGHTING

Lighting strategy of the ceiling and openings generate a magnificent ambiance in a meditation room.

WINDOWS

Daylighting is the activity of installing windows, alternative openings, and reflective facades in order to help sunlight (direct or indirect) offer operational internal lighting. Daylighting in building design proposes to maximize visual amenity and minimize energy utilization. Energy savings is accomplished from the condensed utilization of artificial (electric) lighting or from passive solar heating. Artificial lighting energy utilization can be decreased by merely fewer electric lights where daylight is existent or by automatically dimming or switching off electrically powered lights in retort to the existence of daylight – a strategy identified as daylight harvesting.

ROOF LIGHTS

The substitute to skylights are roof lanterns. They are daylighting cupola that rest above a roof, as opposed to skylights which are built into a roof's structure. They contribute as both an architectural feature and a manner of accustoming natural light into an area, and are generally wooden or metal constructions with a bunch of glazed glass panels.

The amount of daylight administered in an interior space can be estimated by computing illuminance on a grid or venturing a daylight factor scheming. Computer programs like Radiance allows an architect or engineer to expeditiously compute paybacks of a distinct design.

GLAZING

Diverse varieties and standards of glass and dissimilar window treatments can also alter the quantity of light transmission through windows. The variety of glazing is a significant subject, communicated by its VT coefficient (Visual Transmittance), also noted as visual light transmittance (VLT). As the name advocates, this coefficient measures how much perceptible light is acknowledged by the window. A low VT (<0.4) can diminish by half or more the light entering into a space. But be also conscious of high VT glass: high VT numbers (say, >0.60) can be an origin of glare. Furthermore, one should also take into interpretation the uninvited effects of outsized windows. Openings standard into translucent walls.

LEED v4 daylighting grades are alike to the old grades, but also propose to “emphasize circadian rhythms, and lessen the use of electrical lighting by familiarizing daylight in the area”. Two possibilities prevail for accomplishing the peak value of these two most contemporary points. One possibility is to utilize a computer simulation to exhibit that a spatial daylight independence of 300 lux for at least 50% of the duration, and a yearly sunlight revelation of 1,000 lux for 250 engaged hours per year, prevails in the area. Another alternative is to display that illuminance standards are amongst 300 lux and 3,000 lux amid 9:00 a.m. and 3:00 p.m. on a perfect day at the equinox for 75% or 90% of the floor area in the space. The long-term objective of the LEED v4 daylighting metrics is to evaluate both the amount and character of the light, as well as to harmonize the usage of glazing to safeguard more light and less cooling capacity.

SOLAR SHADING

Shading coefficient (SC) is a measure of thermal performance of a glass unit (panel or window) in a structure.

It is the proportion of solar gain (due to direct sunlight) penetrating through a glass unit to the solar energy which passes through 3mm Clear Float Glass. It is a pointer of how well the glass is thermally insulating (shading) the interior when there is undeviating sunlight on the panel or window.

The value ranges amid 1.00 - 0.00, but researches show that the value of the SC is characteristically between 0.98~0.10. The inferior the rating, the lesser amount of solar heat is transmitted through the glass, and the superior its shading ability.

Maximum of the heat gained in the rooms is due to solar radiation approaching through the glazing. The glazing protection has two chief effects:

- To thwart glare
- To lessen indoor temperature.

RESULTS

Types of lights and their reaction on participants

Changing ECG values of participants with changing colour of light –

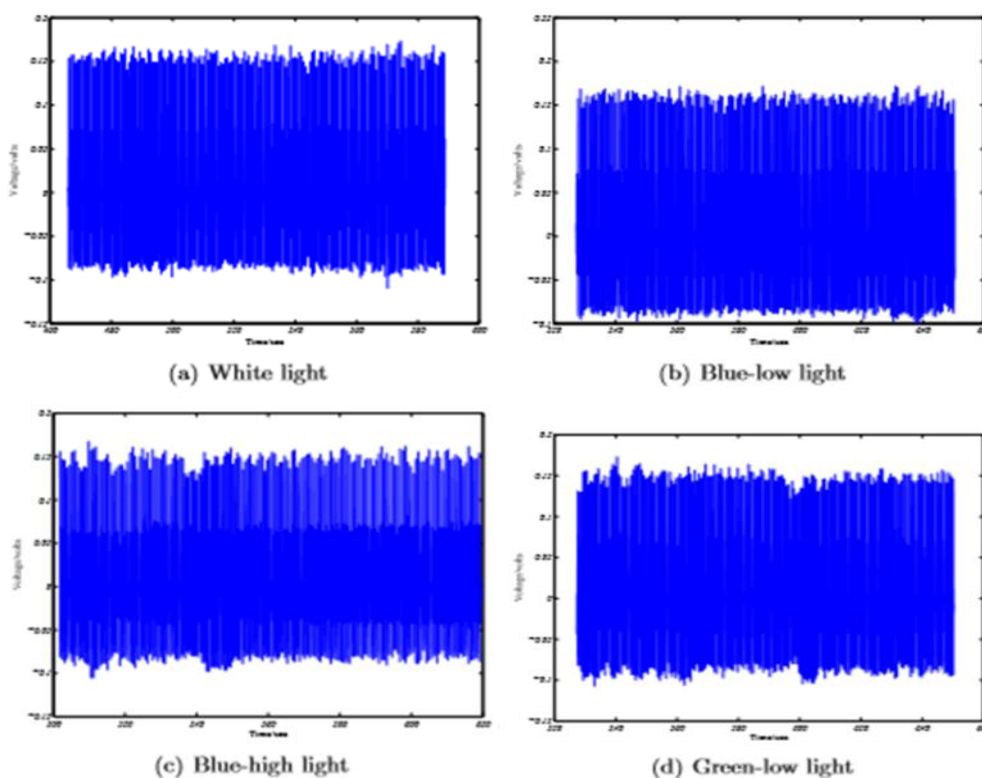


Figure No. 5 Changing ECG values of participants with changing colour of light

Source: Nadeen Abbas (2006), Psychological and physiological effects of light and colour on space users,

Changing SC values of participants with changing colour of light –

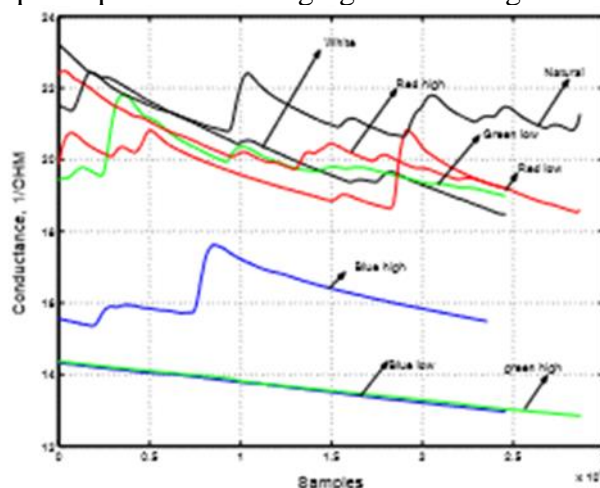


Figure No. 6 Changing ECG values of participants with changing colour of light

Source: Nadeen Abbas (2006), Psychological and physiological effects of light and colour on space users

Table No. 1 Intensities of coloured lights

Colour of Lights	Intensity of light in Lux
White	207
Blue low	28
Blue high	48

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Colour of Lights	Intensity of light in Lux
Green low	90
Green high	169
Red low	92
Red high	157
Natural	20 - 105

Table No. 2 RR & HR values

Parameters	Units	White	Blue- high	Blue- low	Green - high
Mean RR	sec	0.73	0.70	0.72	0.70
std RR	sec	0.197	0.175	0.148	0.165
Mean HR	per/min	89.80	91.02	86.97	90.26
std HR	per/min	26.09	23.14	18.11	21.96

DISCUSSION

Traditional Japanese architecture, shōji door, window or room divider consisting of translucent paper or plastic over a frame of wood being held together by a lattice of wood or bamboo will be used as light diffusers for the meditation rooms.

Removal of the solid wall adjacent to the atrium to intensify the average daylight factor and improve the uniformity of daylight across the spaces.

Salt crystal lamps and warm lighting colours will be used. Point source lighting will be provided for meditation along with windows with louvers, light shelves, screens, etc.

Natural light, white light and yellow light will only be taken into account in the designing process. Energy-efficient landscaping materials for careful passive solar choices include hardscape building material and "softscape" plants. The use of landscape design principles for selection of trees, hedges, and trellis-pergola features with vines; all will be used to create summer shading.

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Acknowledgements

We appreciate the encouragement of our family members and colleagues in helping us overcome hurdles. Without their constant support and encouragement, this research would not be possible. We would also like to acknowledge the Lt. Mrs Nilima Nag and the Lt. Mr Jitendra Nath Nag, late grandparents of author Ms Aditi, who were the inspiration of the research paper.

Conflict of Interest

The author declared no conflict of interest.

How to cite this article: Aditi & B. C. Roy (2020). Role of lighting in built forms with reference to meditation resort. *International Journal of Indian Psychology*, 8(3), 42-51. DIP:18.01.006/20200803, DOI:10.25215/0803.006