Impact of Lighting in Retail Cloth Stores on Physiological Health Conditions of Salesperson

J. Deepika[1] and T. Neeraja[2]

*Department of Resource Management and Consumer Sciences, College of Home Science,
Acharya N.G. Ranga Agricultural University, Hyderabad, Andhra Pradesh, India
E-mail: [1]<jangeti2a27@gmail.com>, [2]<neeraja222@yahoo.co.in>*

ABSTRACT Bad lighting arrangements can be unsafe and health hazard. In commercial buildings lighting should fulfill both functional and aesthetic requirements and it should be oriented towards product sales and satisfying the consumers taking into consideration the health, well-being of salespersons and purchasing behavior of consumers. A major challenge in recent times in the illumination field has been to define how light affects health, not only in aspects related to work but also to comfortable work environment. The prime objective of the study was to explore the physiological health conditions of salespersons under lighting in retail cloth stores. For the study, ten retail cloth stores were selected in Hyderabad and Secunderabad, the twin cities of Andhra Pradesh. The study was conducted on 100 salespersons, who were working in these retail cloth stores. The data was collected by using an interview schedule. The findings of the study revealed that the impact of the artificial lighting on physiological health conditions was found to be moderate. Bright lighting played a significant role on the salespersons' health.

INTRODUCTION

Lighting as an art element plays a major role in aesthetics of a building design. But it is also important because it affects human beings physiologically. It is now well recognized that illumination received at the eye is responsible for a number of effects on the human body that are unrelated in any direct sense to vision. Light has measurable neuroendocrine and neurobehavioral effects on the human body, in particular with respect to maintain a regular sleep–wake cycle that is entrained to the natural diurnal cycle of night and day (Lockley and Dijk 2002). Additionally, there is evidence that lighting should fulfill aesthetic, emotional and functional requirements in interior spaces, especially in commercial buildings. In the specific case of lighting in retail stores, the previous work by (Martau 2009) showed significant conflict between a lighting design oriented to product sales and a design oriented to the health and well-being of store employees.

Lighting is a critical tool in human functioning. Light is not just for vision. Light can affect human behavior, mood and health via pathways other than the visual system. One of the important pathways via which light can affect humans is through the circadian system. (Mariana 2013). Lighting should be designed to provide people with the right visual conditions that help them to perform visual task efficiently, safely and comfortably. People perceive their luminous environment through their eyes, but they process this information through their brain. Light scenes are, therefore, judged in connection with references and expectations (Brainard et al. 2001; Cajochen et al. 2005). The luminous environment acts through a chain of mechanisms on human physiology and psychological factors, which further influence human performance and productivity (Gligor 2004).

De kort and Smolders (2010) revealed that dynamic lighting showed no significant differences in eye strain and sleep quality, although, employees were more satisfied with the dynamic lighting. Hubalek (2010) revealed that the amount of light entering into the eye during the day appears to have a positive impact on sleep quality the following night. Many shopping mall buildings have uncomfortable conditions for occupants, who, out of necessity end up adapting to themselves to the environment (Martau and Duro 2005; Martau 2009).

A study was conducted by Mahmood et al. (2008) to highlight the effects of visible light on the skin. As a result of advances in the understanding of skin optics, and comprehensive studies regarding the absorption spectrum of endogenous and exogenous skin chromophores, various biologic effects have been shown to be exerted by visible light radiation including erythe-

ma, pigmentation, thermal damage and free radical production. It has also been mentioned that visible light can induce indirect DNA damage through the generation of reactive oxygen species. Izso et al. (2009) revealed that the psycho-physiological effects of different lighting conditions had shown significant differences in skin conductance response.

Jaen et al. (2011), revealed that there were no visually perceptible differences between the two forms of lighting, that is low (3%) and high (32%) whereas, Nelson et al. (2003) investigated the effect of a 5 hour light exposure to a high light level (1000 lux at eye level) on sleepiness and performance compared to less than 5 lux during daytime under a constant routine after two nights of sleep restriction. Results showed that exposure to 1000 lux had a significant effect on subjective sleepiness, performance and eye movements.

The purpose of the study was to find out the impact of lighting on physiological health conditions of salespersons in retail cloth stores.

METHODOLOGY

The methodology is presented under the following heads:

Selection of Area

A survey was conducted in ten retail cloth stores at Hyderabad and Secunderabad, the twin cities of Andhra Pradesh in the year 2013, March.

Selection of Sample

A total of 100 workers working as sales person and getting exposed to artificial lighting continuously in retail cloth stores, formed the sample to study the impact of lighting in retail cloth stores on selected physiological health parameters of the salesperson.

Variables and Their Measurement

The independent variables of the study were age of the salesperson, number of years of work experience and quantity of lighting parameters in retail cloth stores. The dependent variables selected for the study perception of visual discomfort, mood and alertness. In the present investigation the quantity of illumination in retail cloth stores was taken as a base for understanding the differences among retail cloth store. According to United States Environmental Protection Agency (1997), the quantitative parameters of illumination are luminous flux (lm), illuminance (lux), luminance (cd/m2). Hence, these lighting parameters were taken as independent variables. These parameters were measured on floor, ceiling, backside of the consumer seating (wall 1), left hand side of the consumer seating (wall 2), wall facing the consumer seating (wall 3) and right hand side of the consumer seating (wall 4).

Tools Used

Physiological health conditions viz., skin, eye, hair and sleep were measured by developing an interview schedule.

Data Analysis

Frequencies and percentages were calculated for the profile of the respondents on the variables. The four outcome groups based on the similarities of lighting conditions were treated as independent variables for data analysis. The data was subjected to ANOVA, to find out the association between independent and dependent variables of the study. The data collected on salesperson physiological health conditions was tabulated, presented and discussed below. Hypothesis was formulated to test the relationship between independent and dependent variables.

RESULTS AND DISCUSSION

Demographic Data

The participants for the study were mostly middle aged persons, aged 34.04 ± 8.96 years (mean $\pm$ SD). Years of work experience of the selected salespersons ranged from 2-35 years. Comparatively, a larger proportion (38%) of the sample bared a work experience of 6-15 years. Twenty eight per cent of the sample had > 16 years of experience as salesperson.

Impact on Skin

The respondents were asked to indicate the frequency of experiencing symptoms on skin like heat rashes, feeling of irritation, white patches

on hands and body, redness, heat bubbles, allergy symptoms, feeling of itching and feeling of dry skin. The possible score range was between 8 and 24. The scores were interpreted in a way that the higher the score higher the frequency of experience of symptoms on skin and higher the impact of artificial lighting in the work environment on the skin of salespersons in the retail cloth stores. The score of the respondents in the study ranged between 8 and 14. The mean score was found to be 8.79 with a standard deviation of 1.19. Only one per cent of the respondents scored above 14. Twenty five per cent of the respondents scored medium and Seventy four per cent of the sample scored below 9.

Table 1: Distribution of sample by symptoms due to light exposure on skin (N=100)

Skin	Frequency	%
Below 9	74	74
Between	25	25
Above 14	1	1
Total	100	100
Mean		8.79
S.D		1.19

From the distribution of Table 1, the impact of the artificial lighting in the retail cloth stores on the skin of the salespersons who were working as salesperson was found to be moderate.

According to skin, Analysis of variance was performed among groups of retail cloth stores. It was found that there was no effect on the skin of the salespersons that get exposed to artificial illumination throughout the day. The F-value was found to be non-significant. Hence, the null hypothesis was accepted (Table 2).

Impact on Eye

Impact of lighting in retail cloth stores on the eyes of salespersons was studied. The respondents were asked to indicate the frequency of experiencing symptoms in eye like watering, redness, itching, dry eyes, burning eyes, heaviness of the eyelids, tired or sore eyes and sticky eyes. The possible score range was between 8 and 24. The score of the respondents in the study ranged between 8 and 21. The mean score was 14.8 with a standard deviation of 3.13. The scores were interpreted in such a way that the higher the score, higher the frequency of experiencing the symptoms in eye and higher the impact of artificial lighting in the work environment on the eye of salespersons in the retail cloth stores. Sixty-six percent of the respondents scored medium whereas equal proportion (17%) of the sample scored below 12 and above 18 (Table 3).

Table 3: Distribution of sample by symptoms due to light exposure on eye (N=100)

Eye	Frequency	%
Below 12	17	17
Between 13-17	66	66
Above 18	17	17
Total	100	100
Mean		14.8
S.D		3.13

From the distribution of sample, it was to skin the impact of artificial lighting in retail cloth stores on eye was found to be more.

According to eye, Analysis of variance was performed among groups of retail cloth stores. The 'F' value was found to be non-significant (Table 4). Hence, the null hypothesis was ac-

Table 2: Analysis of variation among groups due to exposure to lighting in retail cloth stores on workers skin

Effect	Within groups	Between groups	F - Value	Probability F-Value	Level of significance
Group	3	96	0.58^{NS}	0.0577	NS

** - significant at 0.01 level, *- significant at 0.05 level, NS – Non Significant

Table 4: Analysis of variation among groups symptoms due to lighting exposure in eye

Effect	Within groups	Between groups	F - Value	Probability F-Value	Level of significance
Group	3	96	0.95^{NS}	0.4196	NS

** - significant at 0.01 level, *- significant at 0.05 level, NS – Non Significant

cepted. The salespersons were found experiencing symptoms like watering, redness, itching, dry eyes, burning eyes, heaviness of the eyelids, tired or sore eyes and sticky eyes in their eyes, but the study revealed that there is no impact of illuminated environment in retail cloth stores on salespersons eye. Thus, the null hypothesis was accepted. The findings of the study conducted by Jaen et al. (2011), wherein the study revealed that there were no visually perceptible differences between the two forms of lighting that is, low (3%) and high (32%).

Impact on Hair

The respondents were asked to indicate the frequency of experiencing symptoms on hair like hair loss, dandruff, grey hair, feeling of scratch or itching, dry hair and baldness. The responses were quantified by systematically scoring them. The possible score range was between 6 and 18. The score of the respondents in the study ranged between 6 and 16. The mean score was 10.97 with a standard deviation of 2.68. More than half of the respondents (57%) scored medium and seventeen per cent of the sample scored above 14. The remaining 26 per cent of the sample scored below 8 (Table 5).

Table 5: Distribution of sample by symptoms due to light exposure on hair (N=100)

Hair	Frequency	%
Below 8	26	26
Between 9-13	57	57
Above 14	17	17
Total	100	100
Mean	10.97	
S.D	2.68	

From the distribution of table it was evident that the impact of the artificial lighting in the retail cloth stores on the hair of the salespersons who were acting as salesperson was found to be moderate. Mostly, the respondents were experiencing the symptoms related hair sometimes (57%) and never (26%).

According to hair, analysis of variance was performed among groups of retail cloth stores.

The 'F' value was found to be significant at 0.05 level (Table 6). It was found that there exists a relationship between lighting conditions in retail cloth stores and its impact on hair of the salesperson. Artificial lighting in the retail cloth stores was found to have an impact on the hair of the salespersons. Salespersons were found complaining about baldness.

Impact on Sleep

Impact of lighting in retail cloth stores on the sleep of salespersons was explored in the present study. The respondents were asked to indicate the frequency of experiencing symptoms on sleep like difficulty in falling asleep at night, waking up frequently during the night, light, fragmented, or un-refreshing sleep, sleepiness and low energy during the day, difficulty in getting back to sleep after waking up during the night and taking sleeping pills before going to bed. The scores were interpreted so that the higher the score higher the frequency of experience of symptoms of sleep disturbances and higher the impact of artificial lighting in the work environment on the sleep of salespersons in the retail cloth stores.

The possible score range was between 6 and 18. The score of the respondents in the study ranged between 6 and 12. The mean score was 9.37 with a standard deviation of 1.49. Sixty four per cent of the respondents scored medium and twenty seven per cent of the sample scored above 11. The remaining 9 per cent of the sample scored below 8 (Table 7).

Table 7: Distribution of sample by symptoms due to light exposure on sleep (N=100)

Sleep	Frequency	%
Below 8	9	9
Between 9-10	64	64
Above 11	27	27
Total	100	100
Mean	9.37	
S.D	1.49	

Table 6: Analysis of variation among groups symptoms due to exposure to lighting on hair

Effect	Within groups	Between groups	F - Value	Probability F-Value	Level of significance
Group	3	96	0.27*	0.0247	0.05

** - significant at 0.01 level, *- significant at 0.05 level, NS – Non Significant

The impact of the artificial lighting in the retail cloth stores on the sleep of the salespersons who were working as salesperson was found to be moderate. Mostly, the respondents were experiencing the stress symptoms related to sleep sometimes (64%) and always (27%).

According to sleep, analysis of variance was performed among groups of retail cloth stores. The 'F' value was found to be significant at 0.05 level (Table 8). It was found that there existed a relationship between lighting conditions in retail cloth stores and its impact on the sleep of the salesperson. Salespersons, who were exposed to lighting in retail cloth stores suffered with sleeping disorders. The salespersons were found complaining about difficulty in falling asleep at night, waking up frequently during the night, light, fragmented, or un-refreshing sleep, sleepiness and low energy during the day, difficulty in getting back to sleep after waking up during the night. The results of the study were in line with the study conducted by Nelson et al. (2003), investigated the effect of a 5 hour light exposure to a high light level (1000 lux at eye level) on sleepiness and performance compared to less than 5 lux during daytime under a constant routine after two nights of sleep restriction. Results showed that exposure to 1000 lux had a significant effect on subjective sleepiness, performance and eye movements.

General Health Conditions of Sales Person

Impact of lighting in retail cloth stores on the health conditions of sales person was explored in the present study. The respondents were asked to indicate the frequency of experiencing symptoms on general health conditions like feeling of exhaustion by the end of the working, occurrence of headache often while working, experience the feeling of loosing concentration, feeling of dizziness, feeling of tiredness, feeling of stress, frequently falling sick, body pains during the day, loss of appetite and feeling of fatigue. The respondents were asked to indicate the frequency in terms of always, sometimes and never. The scores were interpreted such that the higher the score higher the frequency of experience of symptoms of general ill health conditions and higher the impact of artificial lighting in the work environment on the general health conditions of sales person in the retail cloth stores.

The possible score range was between 10 and 30. The score of the respondents in the study ranged between 13 and 24. The mean score was 17.85 with a standard deviation of 2.01. Sixty- nine per cent (69%) of the respondents scored medium (Table 9). Twenty per cent of the sample scored high general ill health conditions that is, above 20. The remaining 11 percent of the sample scored below 16. Comparatively higher proportion (69%) scored medium. The impact of the artificial lighting in the retail cloth stores on the general health of sales person who were working as sales person was found to be moderate (Table 9).

Table 9: Distribution of sample by the effect of light exposure on general health conditions (N=100)

Hair	Frequency	%
Below 16	11	11
Between 17-19	69	69
Above 23	20	20
Total	100	100
Mean		17.85
S.D		2.01

Table 8: Analysis of variation among groups symptoms due to exposure to lighting on sleep

Effect	Within groups	Between groups	F - Value	Probability F-Value	Level of significance
Group	3	96	3.06*	0.0319	0.05

** - significant at 0.01 level, *- significant at 0.05 level, NS – Non Significant

Table 10: Analysis of variation among groups symptoms due to exposure to lighting on general health conditions

Effect	Within groups	Between groups	F - Value	Probability F-Value	Level of significance
Group	3	96	2.53[NS]	0.0614	NS

** - significant at 0.01 level, *- significant at 0.05 level, NS – Non Significant

According to general health conditions, Analysis of variance was performed among groups of retail cloth stores. The 'F' value was found to be non-significant (Table 10). Hence, the null hypothesis was accepted. There exists no relationship between lighting conditions in retail cloth stores and its impact on general health conditions of the sales person. Lighting condition in retail cloth stores was not exerting any impact on general health conditions of the sales person.

CONCLUSION

The present study was taken up to explore the impact of lighting on salesperson physiological health conditions in ten retail cloth stores. All the salespersons reported that they had to work continuously for longer periods under lighting. The impact of the artificial lighting in the retail cloth stores, on the physiological health conditions of the salesperson was found to be moderate. Analysis of variance was found significant on hair and sleep and non-significant on skin and eye.

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