

## **The effects of exposure to natural light in the workplace on productivity of office workers**

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**Abstract—** *To achieve energy efficiencies day-lighting has been used for the primary purpose of illumination as it is estimated that 30-50% of the energy cost in office buildings is spent on lighting. Over the years number of studies has been conducted to study the relationship between lighting and employees productivity and previous research indicates that lighting is important to the overall quality of the workspace. There is a need to find out relationship of perceived satisfaction with natural light on employees productivity. A total of 250 employees from various offices of Ludhiana were recruited as sample. The age range of the sample was between 25 to 50 years. The questionnaire used was an adapted and modified version of already existing scales of occupants' satisfaction with indoor environment quality (IEQ) components of other buildings by different researchers. Results indicate that employees productivity is positively correlated with satisfaction with light in Indian population. Natural lighting is another important concern in designing an appropriate office that architects must pay attention to increase employees' productivity.*

**Keywords—** *environment, lighting, productivity, Design, Built environment*

### **I. INTRODUCTION**

Human beings spend a large amount of time indoors and with the increase in the use of computers for both business and recreational purposes, the potential for sedentary, indoor life increases. Windows and lighting have been considered in varying ways in the history of buildings design, with consideration of environmental and cost saving issues. To achieve energy efficiencies day lighting has been used for the primary purpose of illumination as it is estimated that 30-50% of the energy cost in office buildings is spent on lighting. Over the years number of studies has been conducted to study the relationship between lighting and employees productivity and previous research indicates that lighting is important to the overall quality of the workspace. According to a 1997 study sponsored by the American Society of Interior Designers (ASID), 68 percent of all office workers were concerned about their lighting. Office workers consistently rated poor lighting as the first or second concern that needed to be addressed. Cakir and Cakir (1998) in a multiple building study in Germany, identifies a 19% reduction in headaches for workers with separate task and ambient lighting, as compared to workers with ceiling-only combined task and ambient lighting. Researchers have overwhelmingly concluded that offices with larger windows have positive impacts on user satisfaction due to the expanded views and increased penetration of natural light (Keighley, 1973; Boubekri et al., 1991; Leather et al., 1998). However, there can be no guarantee that natural light will always be successful in maximizing satisfaction; daylight can cause visual discomfort through glare and distraction, and it can diminish the stimuli and task presents to the visual system (Veitch et al., 2005). People will take action to reduce or eliminate daylight if it causes discomfort or increases task difficulty (Kibert, 2005). There is dearth of studies in North Indian population. Present study is an attempt to study the effect of natural daylight on productivity of office employees.

### **II. METHODOLOGY**

#### **Sample**

A total of 250 employees from various offices of Ludhiana were recruited as sample. The age range of the sample was between 25 to 50 years. The employees who were working for the last three years in a particular organization were considered for inclusion in this study. The minimum educational qualification of the selected subjects was graduation.

**Questionnaire**

The data collection instrument for this study was a structured questionnaire developed by the researcher with the help of experts. The questionnaire is adapted and modified version of already existing scales of occupants' satisfaction with indoor environment quality (IEQ) components of other buildings by different researchers. The questionnaire items were developed to reflect the satisfaction/comfort/productivity components of the office environment. The questionnaire for the study contained 44 total items pertaining to employees' general demographics and satisfaction with thermal, acoustic, and lighting conditions.

**Data Analysis**

For result findings and in-depth analysis of the different components of office environment on the productivity of the office employees, statistical techniques of correlation has been used. SPSS 16 software as research tool for data analysis was used for this research.

**III. RESULTS AND DISCUSSION**

TABLE 1  
 DESCRIPTIVE STATISTICS

<b>Variables</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>Respondents (N)</b>
Productivity	3.51	.73	250
Lighting	3.45	.73	250

TABLE 2  
 COEFFICIENTS OF CORRELATIONS BETWEEN PRODUCTIVITY AND ELEMENT OF OFFICE DESIGN

<b>Sr. No.</b>	<b>Variable</b>	<b>(r)</b>
1	Lighting	.17**

\*\* Significant at .01 levels

Results suggest that employees' productivity is positively correlated with satisfaction with natural light. The obtained findings are consistent with earlier western research (Boubekri et al., 1991; Nagy et al., 1995; Leather et al., 1998; Knez and Kers, 2000; Reinhart, 2002, Brill et al., 1984; Verderber and Reuman, 1987; Marans and Yan, 1989; Galasiu and Veitch, 2006). The main purpose of office lighting is to provide a comfortable and an efficient working environment; the presence of visual and psychological comfort conditions ensures user well-being and increases motivation that will lead to a higher performance and improved productivity (Manav and Yener, 1999; Manav, 2007; Odemis et al., 2004). The quality of lighting in a workplace does have a significant effect on productivity. With adequate natural lighting workers can produce more products with fewer mistakes, which can lead to increase in productivity. Good lighting can decrease errors as well as decrease eye-strain and the headaches, nausea, and neck pain which often accompany eyestrain.

#### IV. CONCLUSIONS

It can be concluded that pleasant environment created by natural light is considered important by the employees and does affect productivity of employees of office workers. So it is imperative that we pay utmost attention to provision of natural light in offices to achieve optimal level of productivity of offices employees.

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