Gender differences in thermal comfort among employees working in offices of Chandigarh

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Abstract

Indoor temperature is one of the fundamental characteristics of the indoor environment. India has extraordinary climatic regions that range from tropical to the south region and the Himalayas experience alpine climate. The Chandigarh city is the pioneer planned city of India having temperature range between 1 C to 45 C. Aim of the present research was to study the effect of gender of employee on thermal comfort. The total of 660 employees from various offices of Chandigarh was recruited as sample. The age range of the sample was between 25 to 60 years. Sample was divided into two groups Group 1 consisted of 303 male employees and Group II consisted of 357 female employees. It was observed that significant gender differences were found on satisfaction with the office temperature. Male employees were found to be more satisfied with their temperature as compared to their female counterparts. The present study also supported the general consensus that gender differences exist, in thermal discomfort. So it is imperative that we pay utmost attention to needs of female employees to achieve optimal level of effective productivity in offices.

Keywords: environment, thermal , perceived satisfaction, temperature, Design, Built environment

1. Introduction

Indoor temperature is one of the fundamental characteristics of the indoor environment. The indoor temperature affects several human responses, including thermal comfort, perceived air quality, sick building syndrome symptoms and performance at work. Increased evidence shows that indoor environmental conditions substantially influence health and productivity. Comfort and productivity loss of 15% was reported due to thermal conditions [11]. There is some evidence that high temperature (> 25.4 C) is associated with lower work performance. In general, warmer temperatures above 24.5-25.4 °C induced a decrement in performance. Over the years several studies have investigated the effects of temperature on Field studies have found that although gender had no significant effect on neutral temperatures, however females tended to be more dissatisfied in real buildings[3][4][1][2].

Karjalainen came to the same conclusion by conducting a meta-analysis on thermal comfort and gender with a mixed of chamber and field studies (Karjalainen 2012). His review examines scientific literature on the effect of gender on indoor thermal comfort. Gender differences have been generally considered to be small and insignificant but this review shows that a growing number of studies have found significant differences in thermal comfort between the genders. Clearly more than half of the laboratory and field studies have found that females express more dissatisfaction than males in the same thermal environments. Very few studies have found males to be more dissatisfied than females. A meta-analysis shows that females are more likely than males to express thermal dissatisfaction (ratio: 1.74, 95% confidence interval: 1.61–1.89). However, most studies found no significant difference in neutral temperatures between the genders. Females are more sensitive than males to a

deviation from an optimal temperature and express more dissatisfaction, especially in cooler conditions.

In India this is a new area of research. Aim of the present research was to study the effect of gender of employee on thermal comfort among employees working in Chandigarh.

2. Methodology

Sample

A total of 660 employees from various offices of Chandigarh were recruited as sample. The age range of the sample was between 25 to 60 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. In the present study sample was divided into two groups Group 1 consisted of 303 male employees and Group II consisted of 357 female employees.

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. The items of the questionnaire were related to the occupants' satisfaction of the IEQ components of thermal, acoustic, and lighting conditions. They were rated by the occupants based on a five-point Likert-type scale (1= "very dissatisfied" to 5 = "very satisfied").

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 t test has been used. SPSS 16 software as research tool for data analysis was used for this research.

3. Results and Discussion

According to the sample collected, 45.9 percent samples employees were female and 54.1 percent employees were male. Feedback of overall samples according to the gender and the mean on satisfaction with temperature among female and male respondents are detailed in Table 1.

Table 1 Significance of Mean Difference in Scores of temperature between Male (N=357) and Female (N=303) Employees

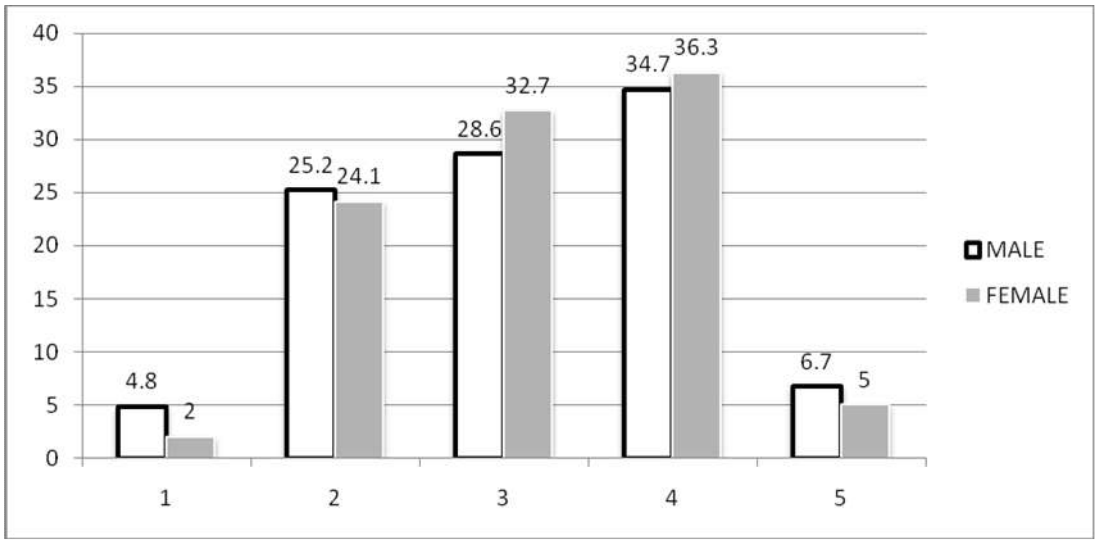
Variable	Gender	N	Mean	Std. Deviation	Std. Error Mean	Mean Difference	t
Temperature	F	303	2.9794	.41469	.02382	-.07385	-2.148*
	M	357	3.0532	.46049	.02437		

Table 2: Satisfaction with Temperature of Office

Question	Response(%)	
	Male	Female
Room temperature affects your normal level of productivity	41.4	41.3
Temperature of my workspace in winters	55.8	42.6
Temperature of my workspace in summers	53.2	45.2
Control temperature or airflow in my office	41.1	30.7

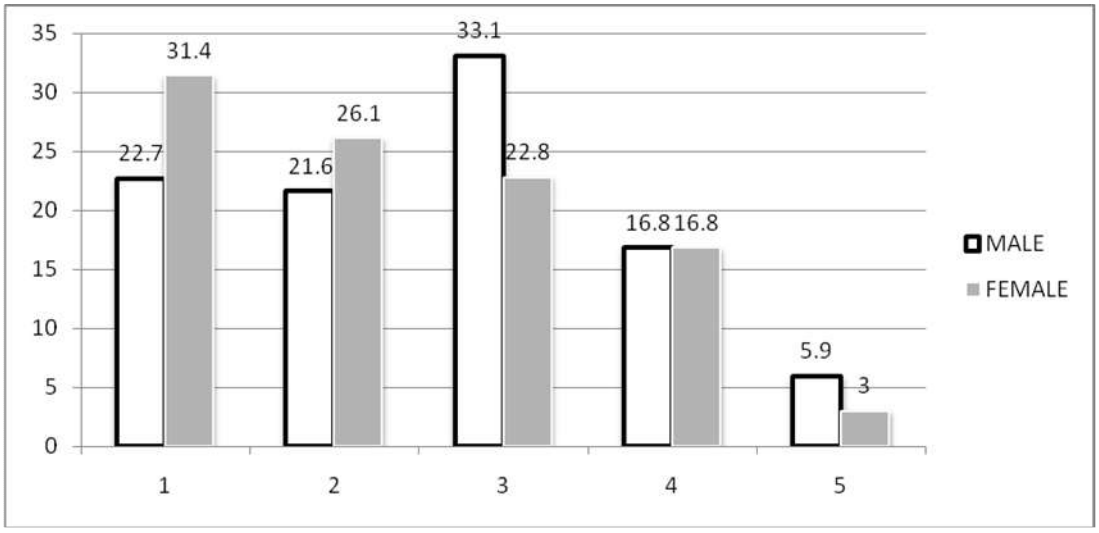
1 Room temperature affects your normal level of productivity

No effect , Positive effect, Normal effect, Quite good effect, Bad effect



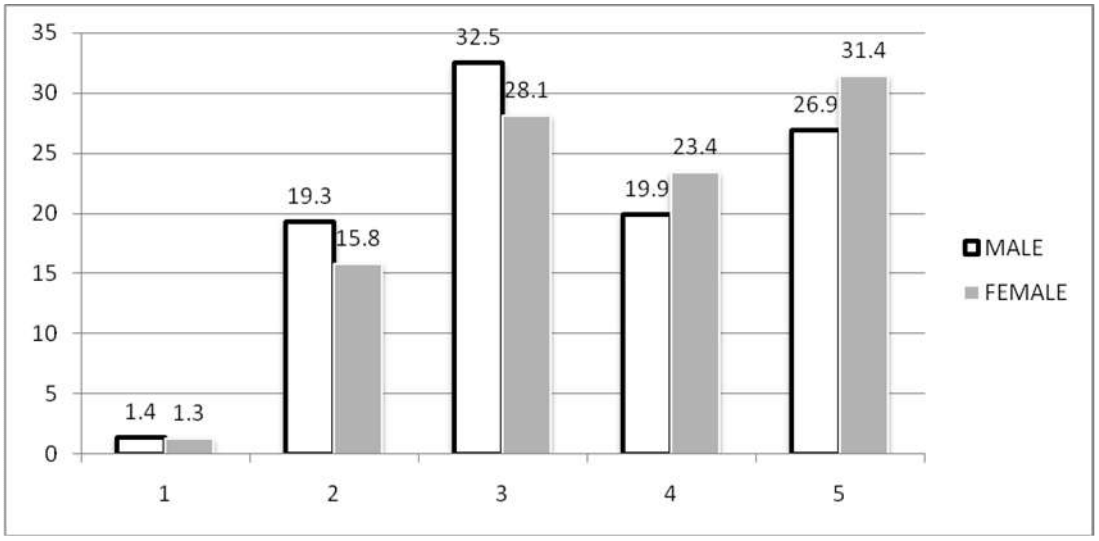
2 Temperature of my workspace in winters

Cold, Cool, Pleasant, Slightly warm, Warm



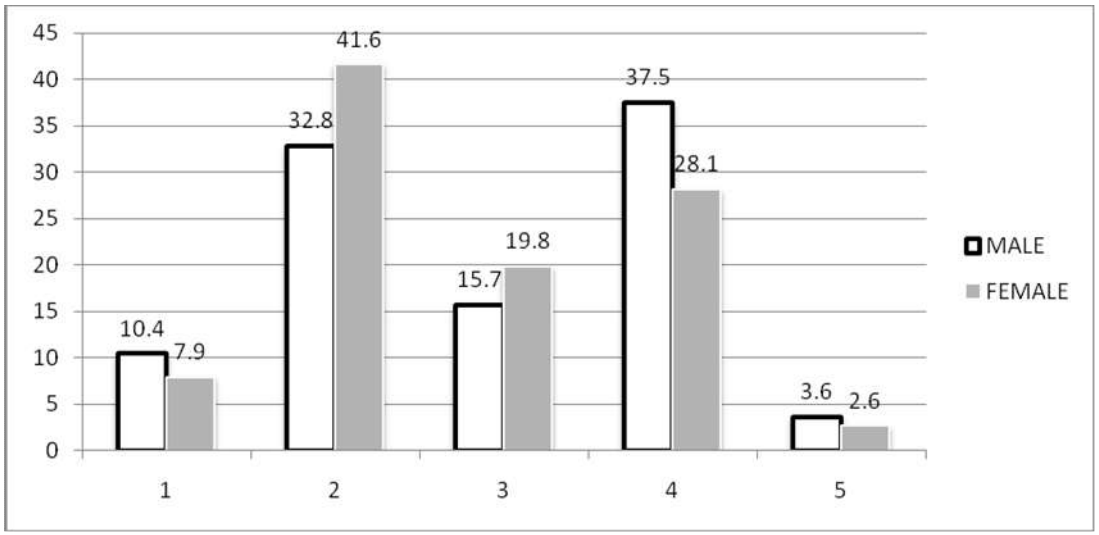
3 Temperature of my workspace in summers

Cold, Cool, Pleasant, Slightly warm, Warm



4 Control temperature or airflow in my office

strongly disagree, disagree, neutral, agree, strongly agree



It was observed that significant gender differences were found on satisfaction with the office temperature. Male employees were found to be more satisfied with their temperature as compared to their female counterparts. These findings corroborate the findings of previously published field research from west. Women have previously been reported as being less satisfied with indoor thermal environment [3][1][4][7][2][8].

Differences between the thermal comfort responses of females and males in field studies have sometimes been attributed to clothing differences between the sexes. Furthermore, local discomfort resulting from greater clothing insulation variability among female office workers might have contributed to the higher levels of thermal unacceptability for females in the current study. A laboratory experiment that found a high correlation between the whole-body thermal sensation and local thermal sensation among females tends to support this argument. McNall et al. that females have a lower metabolic rate per unit surface area under sedentary activity than males. Physiological differences between the two sexes may have an influence on their thermal responses[9]. In their review article Stocks et al. concluded that the menstrual and other regulatory hormones affected thermal comfort responses, thermoregulation and thermogenic thresholds of females[10]. Havenith and Middendorps' laboratory study suggested that gender differences in physiological responses to heat stress in warm-humid and hot-dry exposures can be attributed to factors such as percentage of body fat and the surface-to-mass ratio[6]. In relation to females' sensitivity to indoor air quality problems or health symptoms, some researchers infer that the reason may be due to differences in hormonal levels giving different psychosocial thresholds for the stimuli. Golja et al. observed just noticeable skin temperature thresholds by directly stimulating subjects' forearms. Their experimental study demonstrated that females had a significantly smaller skin temperature threshold for cool sensations to be noticed (0.3K and 0.7K cooler than adapted temperature for female and male subjects respectively). Likewise on the warm side, females reported warm sensations when skin temperature rose 0.7K above adapted temperature, compared to 1.2K for male subjects. These findings led Golja et al. to conclude that women are more sensitive to cold and warm conditions than men[5].

4. Conclusion

The present study also supported the general consensus that gender differences exist, in thermal discomfort. So it is imperative that we pay utmost attention to needs of female employees to achieve optimal level of effective productivity in offices.

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