



**ORIGINAL RESEARCH PAPER**

**Management**

**TO STUDY THE IMPACT OF AGE OF EMPLOYEES ON PERCEIVED INDOOR ENVIRONMENT QUALITY AND PRODUCTIVITY IN INDIAN POPULATION.**

**KEY WORDS:** environment, age, perceived satisfaction, correlate, Design, Built environment

**Dr. Gurkirpal Singh**

Head of Department, IKG Punjab Technical University, Jalandhar

**ABSTRACT**

Indoor environmental quality (IEQ) can have directly effects on occupants' health and productivity. However, indoor environments deemed satisfactory by a certain occupant group may not be satisfactory to another. Building occupants often react in noticeably different ways under the same indoor environment, leading to a presumption that various socio demographic variables beyond environmental parameters influence occupants' perception of the quality of indoor environment. Present study aimed to study the impact of age of employees on perceived indoor environment quality and productivity in Indian population. 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. In the present study sample was divided into three age groups Group 1 (25 to 34yr) consisted of 266 employees, Group II (35 to 49yr) consisted of 263 employees, and Group III (50 to 60yr) consisted of 131 employees. The questionnaire was adapted and modified version of already existing scales of occupants' satisfaction with indoor environment quality (IEQ) components of other buildings by different researchers. Findings of present study are in consensus with the previous research. Older respondents were found to be more satisfied with dwellings than younger ones. As employees become older, they may be less likely to struggle to resist or control and becomes more tolerant and accommodating to ones office environment.

**Introduction**

For several decades, there has been research interest in how the conditions of indoor environment affect the office workers' productivity. However, indoor environments deemed satisfactory by a certain occupant group may not be satisfactory to another. Building occupants often react in noticeably different ways under the same indoor environment, leading to a presumption that various socio demographic variables beyond environmental parameters influence occupants' perception of the quality of indoor environment. In fact, despite a very large number of indoor environment surveys, only a few specifically address the age related effect.

Zalejska-Jonsson and Wilhelmsson (2013) studied the impact of perceived indoor environment quality on overall satisfaction in Swedish dwellings. Results suggest that occupants' age has significant impact on overall satisfaction and that younger occupants are more likely to be dissatisfied. Interestingly, the importance of satisfaction with noise increased for occupants between 36 and 65 years.

Few studies suggest that older respondents are found to be more satisfied with dwellings than younger ones (Dekker, et al, 2011; Kamaruzzaman et al., 2011; Choi, et al., 2012). Age was also found to be significant and one of the more powerful predictors in investigations of the relationship between traffic noise exposure and self-reported health status (Brink, 2011). Research also indicates that there is a difference in thermal sensation and thermal acceptance between age groups (Indraganti and Rao, 2010).

Age diversity is seen most of the work places or organizations in Indian offices. Probe is required into the effect of growing age on various indoor environment variables and their relationship with productivity of employees.

**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 three age groups Group 1 (25 to 34yr) consisted of 266 employees, Group II (35 to 49yr) consisted of 263 employees, and Group III (50 to 60yr) consisted of 131 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 ANOVA and schaffes test has been used. SPSS 16 software as research tool for data analysis was used for this research.

**RESULTS AND DISCUSSION**

The sample was divided into three age groups namely Group 1 (25 to 34years), Group II (35 to 49years), and Group III (50 to 60 years). Results of descriptive statistics and one way analysis of variance (ANOVA) for inter age group differences among respondent on productivity and office design components has been presented in Table 1 and Table 2 respectively.

Table 1 and 2 show that significant differences were found among three age groups(25 to 34yr,35-49yr,50 to 60yr) on lighting, spatial arrangement, window view, and nature /plants as their 'F' value of 3.668, 6.874, 7.109 and 5.656 respectively were found to be significant at .05 levels. However, there were no significant differences among three age groups on other elements of office design and productivity as their respective 'F' ratios were not found to be statistically significant. To explore the degree and direction of the differences found among various age groups on lighting, spatial arrangement, window view, and nature /plants of office design and to make a purposeful analysis, Scheffe's post hoc test analysis have been presented in Table 4.8 and means of office design elements among these three age groups have also been depicted in Figures 4.1 to 4.8.

**Table 1: Descriptive Statistics of Various Factors/Elements of Office Design among various age categories**

Variables	Group	N	Mean	Std. Deviation	Std. Error
Furniture	25 to 34 Year	266	3.1861	.69815	.04281
	35 to 49 Year	263	3.1055	.69865	.04308
	50 to 60 Year	131	3.0687	.77958	.06811
	Total	660	3.1307	.71568	.02786
Noise	25 to 34 Year	266	3.0226	.56465	.03462
	35 to 49 Year	263	2.9629	.58675	.03618
	50 to 60 Year	131	2.8893	.57107	.04989
	Total	660	2.9723	.57606	.02242
Temperature	25 to 34 Year	266	3.0160	.41887	.02568
	35 to 49 Year	263	3.0285	.45728	.02820
	50 to 60 Year	131	3.0076	.45567	.03981
	Total	660	3.0193	.44126	.01718
Lighting	25 to 34 Year	266	2.9070	.77249	.04736
	35 to 49 Year	263	2.8935	.72843	.04492
	50 to 60 Year	131	3.0992	.77066	.06733
	Total	660	2.9398	.75791	.02950
Spatial Arrangement	25 to 34 Year	266	3.2190	.74557	.04571
	35 to 49 Year	263	3.0627	.74384	.04587
	50 to 60 Year	131	3.3454	.73932	.06459
	Total	660	3.1818	.75025	.02920
View Window	25 to 34 Year	266	2.7735	.79394	.04868
	35 to 49 Year	263	2.8916	.81091	.05000
	50 to 60 Year	131	3.0992	.84049	.07343
	Total	660	2.8852	.81757	.03182
Nature Plants	25 to 34 Year	266	2.5028	.84129	.05158
	35 to 49 Year	263	2.6084	.86995	.05364
	50 to 60 Year	131	2.8053	.78953	.06898
	Total	660	2.6049	.84892	.03304
Productivity	25 to 34 Year	266	3.6438	.78021	.04784
	35 to 49 Year	263	3.5846	.70455	.04344
	50 to 60 Year	131	3.5992	.72502	.06335
	Total	660	3.6114	.73930	.02878

**Table 2: Analysis of Variance (ANOVA) for three Age category (25 to 34Yr., 35-49Yr. & 50 to 60 Yr.) on various Factors/Elements of Office Design**

Variable	Source	Sum of Squares	df	Mean Square	F	Sig.
Furniture	Between Groups	1.486	2	.743	1.453	.235
	Within Groups	336.055	657	.511		
	Total	337.541	659			
Noise	Between Groups	1.597	2	.799	2.417	.090
	Within Groups	217.086	657	.330		
	Total	218.683	659			
Temperature	Between Groups	.043	2	.022	.110	.895
	Within Groups	128.273	657	.195		
	Total	128.316	659			
Lighting	Between Groups	4.180	2	2.090	3.668	.026
	Within Groups	374.364	657	.570		
	Total	378.543	659			
Spatial Arrangement	Between Groups	7.603	2	3.802	6.874	.001
	Within Groups	363.329	657	.553		
	Total	370.932	659			

View Window	Between Groups	9.331	2	4.666	7.109	.001
	Within Groups	431.162	657	.656		
	Total	440.493	659			
Nature Plants	Between Groups	8.038	2	4.019	5.656	.004
	Within Groups	466.883	657	.711		
	Total	474.921	659			
Productivity	Between Groups	.487	2	.244	.445	.641
	Within Groups	359.702	657	.547		
	Total	360.190	659			

**Table 3: Scheffe's Post Hoc Analysis for Multiple Comparisons among various age categories**

Dependent Variable	(I) Age in years	(J) Age in years	Mean Difference (I-J)	Std. Error	Sig.
Furniture	25 to 34	35-49Yr	.08058	.06219	.432
		>50Yr	.11739	.07634	.307
	35-49	>50Yr	.03681	.07648	.891
Noise	25 to 34	35-49Yr	.05963	.04999	.491
		>50Yr	.13324	.06136	.095
	35-49	>50Yr	.07361	.06147	.489
Temperature	25 to 34	35-49Yr	-.01254	.03842	.948
		>50Yr	.00834	.04716	.984
	35-49	>50Yr	.02088	.04725	.907
Lighting	25 to 34	35-49Yr	.01342	.06564	.979
		>50Yr	-.19228	.08057	.059
	35-49	>50Yr	-.20570	.08072	.040
Spatial Arrangement	25 to 34	35-49Yr	.15625	.06467	.055
		>50Yr	-.12643	.07938	.282
	35-49	>50Yr	-.28268	.07952	.002
View Window	25 to 34	35-49Yr	-.11814	.07044	.246
		>50Yr	-.32574	.08647	.001
	35-49	>50Yr	-.20760	.08663	.057
Nature Plants	25 to 34	35-49Yr	-.10555	.07330	.355
		>50Yr	-.30252	.08998	.004
	35-49	>50Yr	-.19698	.09015	.093
Productivity	25 to 34	35-49Yr	.05920	.06434	.655
		>50Yr	.04456	.07898	.853
	35-49	>50Yr	-.01464	.07913	.983

Note : \* significant at 0.05 level.

The Scheffe's post hoc analysis in Table 3 indicated that statistically significant differences were found between Group II and Group III on lighting. Higher age group seems to be more satisfied with lighting of their office. On spatial arrangement significant differences were found between Group II and Group III. Senior group seems to be more satisfied with spatial arrangement of their office. On window view significant differences were found between Group I and Group III. Group III seems to be more satisfied with window view of their office.

On Nature/plants significant differences found between Groups I and Group III. Senior age group seems to be more satisfied with Nature/plants of their office.

As results indicate significant differences were found on satisfaction with lighting. 50 to 60 years age group seems to be

more satisfied with lighting of their office than 35 to 49 years age group. On satisfaction with spatial arrangement significant differences were found. 50 to 60 yr age group seems to be more satisfied with spatial arrangement of their offices than 35 to 49 yr age group. On window view significant differences were found, 50 to 60yr age group seems to be more satisfied with window view of their office than 25 to 34 age group. On Nature/plants significant differences were found, 50 to 60 yr age group seems to be more satisfied with Nature/plants of their office than 25 to 34 age groups.

Findings of present study are in consensus with the previous research. Older respondents were found to be more satisfied with dwellings than younger ones (Dekker, et al, 2011; Kamaruzzaman et al., 2011; Choi, et al., 2012).

Research indicates that there is a difference in thermal sensation and thermal acceptance between age groups (Indraganti and Rao, 2010). Age was also found to be significant and one of the more powerful predictors in investigations of the relationship between traffic noise exposure and self-reported health status (Brink, 2011).

Although a number of factors may be at play in rising levels of productivity -- including biological and environmental considerations--a tendency towards greater acceptance of oneself and one's life circumstances may play a significant role. As employees become older, they may be less likely to struggle to resist or control and becomes more tolerant and accommodating to ones office environment.

It can be concluded that building occupants often react in noticeably different ways under the same indoor environment, leading to a presumption that various socio demographic variables like age are beyond environmental parameters and influence occupants' perception of the quality of indoor environment.

#### References

1. Dekker, K., de Vos, S., et al. (2011), "Residential Satisfaction in Housing Estates in European Cities: A Multi-level Research Approach," *Housing Stud*, 26(4), pp. 479-99.
2. Kamaruzzaman, S.N., Egbu, C.O., et al. (2011), "The Effect of Indoor Environmental Quality on Occupants' Perception of Performance: A Case Study of Refurbished Historic Buildings in Malaysia," *Energy Build*, 43(2, 3), pp. 407-13.
3. Choi, J.H., Loftness, V., et al. (2012), "Post-occupancy Evaluation of 20 Office Buildings as Basis for Future IEQ Standards and Guidelines," *Energy Buildings*, 46, pp. 167-75.
4. Indraganti, M., and Rao, K.D., (2010), "Effect of Age, Gender, Economic Group and Tenure on Thermal Comfort: A Field Study in Residential Buildings in Hot and Dry Climate with Seasonal Variations," *Energy and Buildings*, 42, pp. 273-81.
5. Brink, M. (2011), "Parameters of Well-being and Subjective Health and their Relationship with Residential Traffic Noise Exposure -A Representative Evaluation in Switzerland," *Environ Int*, 37(4), pp. 723-33.
6. Zalejska-Jonsson, A., and Wilhelmsson, M., (2013), "Impact of Perceived Indoor Environment Quality on Overall Satisfaction in Swedish Dwellings," *Building and Environment*, 63, pp. 134-144.