UMSHA Press

Iranian Journal of Ergonomics

Iran J Ergon, 2023; 10(4): 250-8.
https://journal.iehfs.ir/

Original Article

Investigating the Effect of Environmental Thermal Comfort Components on Students' Cognitive Performance based on the Analysis of Fatigue Factor (Study Sample of Architecture Student of Universities in Ilam)

Hamed Ahmadi[1], **Mojtaba Noorollahi**[2,*], **Mohammad Reza Soleimani**[3], **Ehsan Bitaraf**[3]

[1] Islamic Azad University, West Tehran Branch, Tehran, Iran
[2] Department of Architecture, College of Art and Architecture, Ilam Branch, Islamic Azad University, Ilam, Iran
[3] Department of Architecture, College of Art and Architecture, West Tehran Branch, Islamic Azad University, Tehran, Iran

Article History:
Received: 21/12/2022
Reviced: 21/01/2023
Accepted: 01/03/2023
ePublished: 18/03/2023

***Corresponding author:** Mojtaba Noorollahi, Department of Architecture, College of Art and Architecture, Ilam, Islamic Azad University, Ilam, Iran.
Email:
mojtaba.noorllahi@gmail.com

Abstract

Objectives: Human-made environments can have negative and positive effects on the planet. One of the two-faceted artifacts is the construction of buildings for people's lives, buildings that are being built irregularly and quickly and lead to excessive consumption of fossil resources and energy waste. Become Therefore, one of the most important things in the design of a building is providing its thermal comfort; Comfort that has a direct effect on the cognitive function of humans. In this research, in addition to the topic of thermal comfort, we also discuss fatigue in the classroom, which is one of the factors influencing the cognitive performance of the students.

Methods: In this research, the cognitive performance of people were examined and compared in the range of thermal comfort and the suggested range of the Ashri standard. To investigate their performance in different temperature ranges, 220 architecture students of Ilam universities were selected by systematic random sampling method. The state of thermal comfort, cognitive functions, and fatigue of people was evaluated after measuring environmental factors through questionnaires and standard cognitive function software.

Results: In addition to thermal comfort, which has a direct relationship with the cognitive performance of students, the passage of time is not an exception to this rule, in other words, the cognitive performance of students is derived from thermal comfort and the passage of time, which has a direct effect on academic, mental productivity. and also their practical efficiency. After examining the data in this regard, we reached meaningful results that indicate the highest efficiency of the students in the conditions of proper thermal comfort and the first 60 minutes of the start of their performance.

Conclusion: The results of this research show that even if the thermal comfort of the students' classrooms is provided according to the ASHERI standard, the students' cognitive performance will decrease after 60 minutes from the start of the class.

Keywords: Thermal comfort; Cognitive performance; Fatigue in the classroom; University

Extended Abstract

Background and Objective

According to the data published by the country's statistical organization, the population of Iran has been decreasing in 2022, on the contrary, the young and old population of Iran has always been increasing this year. It is worth considering that the population of this youth is many students, which in 2021 reached more than 3,200,000 students. Therefore, the high number of students in the country requires specific goals as well as the construction of infrastructures, the most important of which are standard buildings and classrooms with the best facilities. This point shows the importance of construction in Iran, which practically does not have the necessary standards. Waste of energy and its excessive consumption are signs of non-standardization of buildings; Due to the fact that energy is difficult to get to the people and has a relatively high cost, excessive consumption of energy also causes air pollution and many problems. According to statistics from official sources, pollution kills hundreds of people in the country every year.

Cognitive function can be said that a person's brain and mind must work in the best functional conditions so that a person can use the maximum cognitive capacity he has. In order to better understand how the human brain system works and how it can use the maximum capacity of its brain, it needs knowledge of the functions that affect the cognitive function and, as a result, the functioning of the mind of a strategic person. To know a set of these diverse strategies that allow a person to recognize and process the information he receives and respond appropriately.

Materials and Methods

This descriptive-analytical research was conducted in the summer and fall of 2022 and winter of 2023. 220 students were selected by systematic random sampling from architectural engineering students of Ilam universities. First, demographic information including gender, place of residence, length of residence, year of birth, height, weight and education was collected for each participant through a questionnaire. After that, the amount of daily physical activity, the amount of clothes and the color of the final cover of the people were recorded. In the next step, environmental factors such as air temperature, radiation temperature, relative humidity, and air flow speed were accurately measured using the Delta Ohm data logger whose specifications are presented in table 1. After that, a seven-point scale (very cold to very hot) was used to estimate subjective thermal sensation according to the ASHERI standard.

Results

Based on diagram 7, in this research, we have prepared three cognitive function tests for the participants. Accordingly, in test number one, we gave a text to the students and asked them to type the text. This stage took 30 minutes. The second test was math and had 30 minutes. At this stage, we gave the students some addition and subtraction of three-digit numbers and asked them to obtain the addition and subtraction without using a calculator. Finally, in the third test, which had 30 minutes like the two previous tests, we gave the students a few texts containing some wrongly typed words and asked them to find and type the correct words. The results show that at the beginning of the test, the students showed a lot of good performance, so that the percentage of the test has reached 43% at the beginning and up to 96%, which is the best performance. In the next test, the performance of students, like the previous test, had an upward trend, in such a way that the performance of the students started from 52% and went up to 97%, which was their best performance. After the completion of the second test, i.e. after 60 minutes passed from the start of the test and at the same time as the start of the third test, the performance of the students faced a significant drop, so that the performance of the students started from 91% and dropped to 17%.

Discussion

The results of this research show that despite meeting the standards of thermal comfort in the classrooms, the cognitive performance of the students has increased in a specific period of time and the progress in cognitive performance is up to a certain time. In other words, the duration of this study for the participants was one and a half hours, and the progress of the students' performance was only in the first hour, and after one hour, we were faced with a significant drop in the cognitive performance of the students. A very important variable that caused the drop in students' performance is their fatigue (according to the results). Also, thermal comfort is one of the important factors in people's satisfaction with the environment, which, in addition to the satisfaction with the environment, improves performance and increases the productivity of people.

Conclusion

Most of the work and activities of human life are done in indoor spaces, so indoor space is very important for humans. Based on this, in recent years, a lot of attention has been paid to indoor air quality by designers, managers and researchers. Since indoor air quality can affect human health and performance, paying attention to this issue in different dimensions such as indoor air quality and thermal comfort can be very important.

Please cite this article as follows: Ahmadi H, Noorollahi M, Soleimani MR, Bitaraf E. Investigating the Effect of Environmental Thermal Comfort Components on Students' Cognitive Performance based on the Analysis of Fatigue Factor (Study Sample of Architecture Student of Universities in Ilam). *Iran J Ergon*. 2023; 10(4): 250-8.