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Research Article

CONDITION OF LIGHTING OF EDUCATIONAL SPACES IN MASJED SOLEYMAN SCHOOLS, SOUTH WEST OF IRAN: ERGONOMIC PRINCIPLES

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Abstract:

Introduction: The physical environment can contribute to children's wellbeing, happiness, creativity and developing independence. It can contribute to and express the quality of children's learning and experiences. As such, this study sought to investigate the condition of lighting of educational spaces in Masjed Soleyman schools [South West of Iran] regarding ergonomic principles in the educational settings.

Materials and Methods: This is a descriptive study and uses a survey instrument. The population included all teachers at elementary, junior and high schools of Masjed Soleyman in the academic year 2015-2016, of whom 267 people were selected as the sample of the study based on cluster sampling. The instrument of the study was a researcher-made questionnaire based on the observation checklist, consisting of 3 items, ranging in 5 degrees, and quantitatively graded from 1 to 5. The highest score and the lowest score were regarded as the most desirable and the least desirable condition of the schools' restrooms, respectively. Data were analyzed using descriptive [frequency, percentile, mean, and standard deviation] and inferential statistics [univariate t-test and Kolmogorov-Smirnov test] using SPSS 21.

Results: The results indicated that the condition of lighting of educational spaces in Masjed Soleyman schools regarding ergonomic principles is unfavorable in appropriate use of natural and artificial light in the classroom [48%]. But appropriate composition of natural and artificial light in the classroom is appropriate. [61%].

Discussion and Conclusion: The choices made in an education and care service about resources, materials, spaces, layout, air and light quality and access to a range of experiences in the indoor and outdoor, have a direct impact on the quality of learning opportunities available to children.

Keywords: Ergonomics, Schools, lighting of educational spaces, Iran.

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INTRODUCTION:

Change is an enduring feature of our education system, be it pedagogical, management or policy. However the built environment of that system, the school is slower and harder to adapt to these changes and so this increases the importance of understanding how their environment is working to fit their needs, in terms of both functionality and comfort. Given that in England alone in 2012 there were over three and half million primary school children. [1]. Light has always been sacred in the major monotheistic religions of the world. In Zoroastrianism, the interpretation of the universe, the essence of angels, and holiness of fire are all based on light. In Judaism, the first creation of God is light and in Christianity, Jesus Christ, is the God's word and light or the father of lights. Light is also emphasized in Islam so much that there is a surah in holy Quran called Light. In holy Quran, the words light and darkness have been repeated 43 and 23 times respectively. [2, 3] The learning environment needs attention as this space is related to students' well-being and learning performance [4]. Studies of school buildings have shown that factors of environmental comfort can greatly affect the learning process [5-11]. Indeed, the physical learning environment has a great impact on students' learning and motivation including the motivation to actively participate in academic activities [12]. There is a power problem in more than six thousand schools in Latin America. The plan of lighting for learning is implemented since 2012 [by the governments of Ibero-America]. They bring solar energy to the schools. This plan was carried out in 500 rural training center and these schools are now equipped with solar panels and computer and they have access to the internet. More than a thousand teachers and 20 thousand students have benefited from this plan. In countries where the project of "lighting for learning" has been implemented in rural school, dropout rate has declined considerably. Accordingly, this plan plays an important role in the economic growth of the rural communities by encouraging students to complete their education. [8, 13]. In Iran, in the area of comparing the current situation of educational environment with international standards as well as on the impact of physical factors on the academic achievement of students in schools, several studies have been conducted. Some of these studies include: Gilavand et al [8, 11]. And study was conducted to evaluate the degree of internal lighting in so as to help identify their potential problems. Some of these studies include: Golmohamadi et al. [14]. In addition, several studies have been carried out overseas in this regard, including Berman et al. [15], Dockrell et al. [16], Wagemans et al. [17], Barrett et al [18] Mott et al [19], Ahmadpoor Samani et al [20] Yacan [21] Bellia et al [22], Stephenson et al [23].

The physical environment can contribute to children's wellbeing, happiness, creativity and developing independence. It can contribute to and express the quality of children's learning and experiences. The choices made in an education and care service about resources, materials, spaces, layout, air and light quality and access to a range of experiences in the indoor and outdoor, have a direct impact on the quality of learning opportunities available to children.[24]. Light has a great influence on humans, indeed it allows vision but it is also related to a series of effects, known as non-visual responses, which include for example melatonin suppression, heart rate and alertness level variations. These effects depend on several characteristics of the light that reaches an user's eyes, including the duration of the exposure to a light stimulus therefore they are particularly relevant in environments where people spend most of their day such as educational environments.[9]. As such, this study sought to investigate the condition of lighting of educational spaces in Masjed Soleyman schools regarding ergonomic principles in the educational settings.

MATERIALS AND METHODS:

This is a descriptive survey to investigate the condition of lighting of educational spaces in Masjed Soleyman schools regarding ergonomic principles in the academic year 2015-2016. The population included all teachers at elementary, junior and high schools [first and second secondary schools] of Masjed Soleyman, of whom 267 people were selected as the sample of the study based on the cluster sampling. The data collection instrument was a researcher-made questionnaire which was developed as an observation checklist to investigate the physical variables of the schools' lighting of educational spaces conditions with 3 items, a 5-degree range [very high, high, medium, low and very low], and the participants' demographic information [age, gender, educational level, etc.]. The experts approved the validity of the questionnaire and its reliability was confirmed by Cronbach's alpha [0.91]. The items of this 3-alternative questionnaire were quantitatively graded from 1 to 5 based on the Likert scale [1-5 points]. The highest score and the lowest score were regarded as the most desirable and the least desirable condition of the schools' lighting of educational spaces, respectively. The researcher distributed the questionnaires among teachers, collected them a week later after completion. Data were analyzed using descriptive [frequency, percentile, mean, and standard deviation] and inferential statistics [univariate t-test and Kolmogorov-Smirnov test] through SPSS 21. Furthermore, the ethical considerations like the participants' consent and ensuring them that their

opinions in the study would be kept confidential, were taken into account.

FINDINGS:

The demographic information of the participants, i.e. their frequency in terms of gender, age, and educational level, is presented in Table 1. Regarding gender, males are more frequent, constituting 60% of the sample. As with educational level, most participants held a BA degree, constituting 53% of the sample. Regarding age, most participants were in the range of 31-40 years old.

The mean, standard deviation, and desirability and standardized percentile, are presented in Table 2 based on the points the participants have given to the physical variables of the schools' restroom conditions in the 7 items and a 5-degree range [very high, high, medium, low and very low]. According to this table, items 1 is 'the students should be

provided with hand washing liquid or soap in the toilets', had 52% of marking. Item 2 is 'students should not drink water in restrooms' drinking fountains and they need to become aware of this by installing warning signs', had 39% of marking. Item 3 is 'the height of the restrooms should be consistent with the students' age in the three levels of elementary, junior, and high school', had 51% of marking. Item 4 is 'one toilet is needed per 45 students', having 51% of marking. Item 5 is 'toilets should be equipped with siphon and washable trash bin with lid', having 58% of marking. Item 6 is 'the presence of air flow for ventilation, i.e. there should be electric fans and openable guarded windows', having 60% of marking. Finally, the item 7 is 'the floor and walls should be covered with washable materials', having 59% of marking. Besides, these items are presented in Figure 1, respectively. The t-test of the items related to the variable of the restroom is shown in table 3.

Table 1: Demographic specifications

Variables	Number and percentage of individuals
Gender	***
Male	[161]- 60%
Female	[106] -40%
Total	[267]-100.0%
Educational level	***
Associate's degree	[28]-10
Bachelor's degree	[141]-53
Master's degree	[83]-31
Ph.D.	[15]-6
Total	[267]-100.0
Age	***
Under 30 years old	[52]-5%
31-40	[53]-20%
26-30	[106]-.40%
41-50	[89]-33%
Up 50 years old	[19]7%
Total	[267]-100.0

Table 2: Mean, standard deviation, and the standardized percentile of the schools' lighting of educational spaces conditions

Items	Code	No.	Mean	SD	Standardized percentile
Appropriate use of natural light in the classroom	X17	267	2.4082	1.30139	48%
Appropriate use of artificial light in the classroom	X18	266	2.4023	1.36252	48%
Appropriate composition of natural and artificial light in the classroom	X19	267	3.0337	1.46474	61%

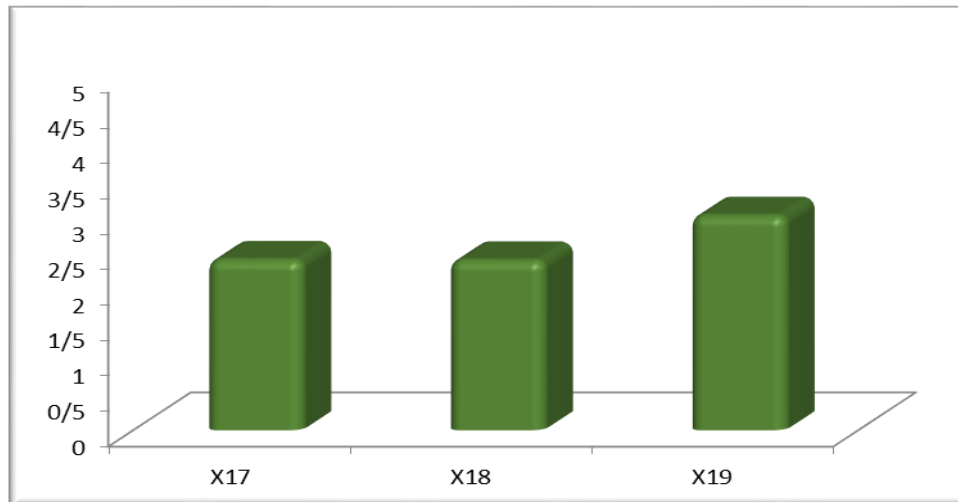


Fig1: Central indexes of lighting of educational spaces variable items

Table3: T-test of the of the lighting of educational spaces variable items

Items	Test Value = 3					
	t statistic	df	P	Mean difference	95% certainty	
					Minimum	Maximum
Appropriate use of natural light in the classroom	-7.430	266	.000	-.59176	-.7486	-.4349
Appropriate use of artificial light in the classroom	-7.155	265	.000	-.59774	-.7622	-.4333
Appropriate composition of natural and artificial light in the classroom	.376	266	.707	.03371	-.1428	.2102



Table 3 indicates that the Sig values of the items 28, 29, and 30 are more than 0.05 and they are in an average condition. The Sig values of other items are less than 0.05, have a negative mean difference, and have an average to low condition.

DISCUSSION:

The results indicated that the condition of lighting of educational spaces in Masjed Soleyman schools regarding ergonomic principles is unfavorable in appropriate use of natural and artificial light in the classroom [48%]. But appropriate composition of natural and artificial light in the classroom is appropriate [61%]. As such, the results are in line with the results of the studies conducted by: Gilavand et al [8, Golmohamadi et al. [14]. Ahmadpoor Samani et al[20], Yacan [21], Stephenson et al[23]. It is proposed that a greater deal of cooperation be made between the health units in the schools of Masjed Soleyman Department of Education, health deputy of Ahvaz Jundishapur University of Medical Sciences, and Khuzestan Province Education Department to eliminate the unfavorable and non-standard cases of the lighting of educational spaces in Masjed Soleyman. The major limitations of this study included the dispersion of the population, lack of a desirable access to them, and unwillingness of some participants to cooperate.

CONCLUSION:

Following the school environmental health standards, one can save millions of Rials which is spent on repairing and maintaining a school, prevent various incidents happening at schools and also prevent the spread of diseases, particularly the infectious diseases. It also reduces the disabilities resulted from the incidents, decreases pharmaceutical and medical costs, provides students with a favorable physical and mental condition to educate, improves the quality of education, and prevents educational failure. In summary, to fully investigate lighting quality in educational environments simultaneous measurements on several visual tasks should be performed and for this purpose the HDR imaging technology is extremely helpful. The analysis of lighting quality should not only focus on the respect of the EN 12464-1 requirements, but also on the analysis of light's characteristics at the users' eye level in order to apply models to evaluate non-visual effects of light.

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