Investigating the Impact of Educational Spaces Painted on Learning and Educational Achievement of Elementary Students in Ahvaz, Southwest of Iran

*Abdolreza Gilavand[1], Mohammad Hosseinpour [2]

[1] Employed Expert on Faculty Appointments at Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.
[2] Associate Professor, Department of Educational Administration, Islamic Azad University of Ahvaz. Ahvaz. Iran.

Abstract

Background

Understanding environmental factors affecting the educational process and including them in educational planning will lead into increased outcome of education, mental health, reduced stress, and higher education performance. This study was conducted to investigate the impact of educational spaces coloring on learning and academic achievement of elementary school students in the academic year of 2015-2016 in Ahvaz.

Materials and Methods

At a Cross-sectional study, a total of 210 students were selected randomly as sample of study. Cluster sampling was done by appropriate allocation and questionnaires were randomly divided among students. Data collection tools included Hermance's achievement motivation questionnaire and researcher-constructed questionnaire (observation checklist to examine the physical parameters of learning environment coloring) and interviews with students. Data of study were analyzed in SPSS-21 software.

Results

The results showed that appropriate coloring of educational environment has impact on learning and academic achievement of elementary school students in Ahvaz (P<0.05).

Conclusion

Our results suggest that educational managers of country must consider these factors in designing educational environments.

Key Words: Educational achievement, Educational spaces painted, Learning, Students.

*Corresponding Author:

Abdolreza Gilavand , Employed Expert on Faculty Appointments at Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

Email: gilavanda@gmail.com

1- INTRODUCTION

Education is a public right that operations related to this important area are considered as responsibilities of society within public and governmental policies. It can be considered as factor of equality and justice, since no society can claim justice and equality without education (1). Elementary school is the first course of public education where children and enter a new world of education and experience life out of home environment, and they face with social realities. Children and adolescents understand the concept of social role, responsibility, work and social relationships in this way and shape their personality with these experiences and perceptions (2). On the other hand, environmental and physical factors have impact on vast areas of human experience, including work performance, social behavior, attitudes, happiness and unhappiness and mental health (3). Designing educational spaces is considered as one of the effective educational factors in the education system. Factors such as teacher, student, teaching methods, curriculum, management, education, family, social environment, designing and coloring educational environment having impact on learning and teaching process have been considered by researchers and planners, and they have reviewed and explored. (4). In addition, school is an environment for students talent flourishing, but lack of attention to ergonomic factors affects students' health and gives them the discomfort in their adulthood (5). Color is a powerful design element that produces profound psychological and physiological reactions. Studies have shown there was a significant relationship between color preferences, emotions, and academic performance in students (6). Studies have also shown that there is a relationship between academic achievement and mental health (7-9). 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: Hosseini-Nasab et al. (10), Malakoutian et al. (11), Ghazizadeh (12), Ebrahami Dastgerdi (13), Moeinpour et al. (14). In addition, several studies have been carried out overseas in this regard, including Gaines et al. (6), Lewinski et al. (15), Dockrell et al. (16), Wagemans et al. (17), Zannin et al. (18), and Zannin et al. (19).

One of the influential factors in new education is the architecture of educational spaces. In new education, school's physical space is not a dull and boring environment, and it plays a key role in quality of educational activities of students, as dynamic and living factor. In fact, in science communication, education is considered as a kind of providing information. In this view, student education not only is influenced by teacher speech, but also numerous other elements are involved in the transmission of the message to him. According to education experts, in a systematic perspective, school architecture and its constituent elements such as color, light, sound, equipment, etc. as well as other factors can have significant impacts on learners and students. On the other hand, color as the key effect of education spaces can be effective in internal efficiency of students. In fact, color as an integral element of architecture has great impact on the morale and behavior of users of buildings affecting strongly their mental and emotional states; in addition, it has been proved that light and colors affect organism of students in terms of visual and non-visual ways (15). In recent years, the curriculum and textbooks has been considered, but this principle, the physical characteristics of educational environment and its impact on students' performance

and spirit have not been investigated so much and only a few of studies have been carried out in this regard. Theoretically, paying attention to environmental factors affecting the educational environments and foresight on supplying facilities and needs of educational spaces not only help managers and planners in adopting right and realistic decisions, but also they are necessity of any kind of educational planning (20). On the other hand, in applied area, understanding environmental factors affecting the educational process and considering them in planning increases mental health of students and reduces their stress, resulting in enhanced educational performance. The aim of this study was to investigate the effect of coloring of educational spaces on learning and academic achievement of elementary students of Ahvaz in 2014 to 2015.

2- MATERIALS AND METHODS

2-1. Study design and population

At a cross-sectional study (2013-2014), the population of the study included all male elementary school students in Ahvaz city- Southwest of Iran, of total elementary students in 2013 academic year, 210 were selected randomly as the sample of the study. Cluster sampling was done by appropriate allocation and questionnaires were randomly divided among students. Considering the number of the students studying in each district, from each district two schools were selected in a pilot and the questionnaires were randomly distributed among the second- and sixth-graders. In this research, the sample data were selected from the different educational areas including educational area No. 1: 50 students, No. 2: 41 students, No.3: 59 students and No. 4: 60 students.

2-2.Data collection tools

Data collection tools included:

- Hermance achievement motivation questionnaire and
- Researcher-made questionnaire (observation checklist to examine the physical parameters of learning environment coloring) and
- Interviews with students in the presence of their parents or teachers.

The content and construct validities of questionnaires were confirmed by factor analysis and internal consistency, and the reliability of the study was confirmed by Cronbach's alpha. Hermance questionnaire was used in the previous studies in Iran. The validity of the Hermes questionnaire was proved by internal consistency and factor analysis. Cronbach's alpha co-efficient and retest method were established for reliability of questionnaire with the rate of 84% and 74% respectively (21).

2-3. Ethical Considerations

The ethical considerations necessary to satisfy the respondents were observed and they were ensured that their views will be kept confidential.

2-4. Measuring tools

2-4-1. Construction questionnaire

Observation checklist to examine physical variables of coloring the learning environment: due to there is no standard questionnaire related to subject of study, after interviews with a number of teachers and experts, to equip and modernize schools and collect their views and taking into account the scientific principles, a questionnaire was developed. Then, by conducting pre-test (among 30 students), reliability and validity of questionnaire was calculated. Their validity was confirmed by content and construct validity was confirmed by a number of experts and their reliability was calculated and confirmed by Cronbach's alpha (87%).

2-4-2. Academic Achievement Motivation Questionnaire of Hermance (21)

It is one of the most common paper and pencil questionnaire to assess the need for achievement. Hermance (1977) constructed this questionnaire based on experimental and theoretical knowledge about the need for achievement and studying the related literature related. The initial questionnaire included 29 questions developed based on ten characteristics that distinguish people who have high achievement motivation with those who have low achievement motivation. To prepare materials of questionnaires, Hermance considered ten characteristics of people as based in selecting questions:

- High level of desire;
- Strong motivation for upward mobility;
- Long resistance facing with assignments or moderate difficulty level;
- Willingness to reattempt in doing assignments;
- Dynamic perception of time, the feeling that things happen quickly;
- Foresight;
- Paying attention to merit criterion in selecting friends, colleagues and model;
- Recognition through good performance at work;
- Doing job well;
- Low risk behavior.

Hermance found these ten characteristics was acquired on the base of previous research and he selected them as guide for selecting the questions. After trial implementation and analyzing the questions and calculating the correlation of individual questions with total test, 29 questions were selected as final questionnaire of achievement motivation. It should be noted that after analyzing the questions, no significant question about the tenth characteristics was included in the final questionnaire. Therefore, the final questionnaire was constructed only on the basis of nine characteristics. The questions of questionnaire were stated as incomplete sentences and multiple options were given for each of the. To equalize the value of questions, four options were written for all 29 questions. The options were given score in terms of intensity of motivation of achievement from high to low or low to high. Scoring the questionnaire was conducted based on nine characteristics that questions were developed based on them. Some of the questions were written positively, while other groups of them were written negatively.

In questions (1, 4, 9, 10, 14, 15, 16, 20, 23, 27, 28 and 29), A was given 1, B was given 2, C was given 3, and D was given 4.

In addition, in questions (2, 3, 5, 6, 7, 8, 11, 12, 13, 17, 18, 19, 21, 22, 24, 25 and 26), A was given 4, B was given 3, C was given 2, and D was given 1, and range of changes is from 29 to 116. If total scores were higher than average, it represents high achievement, while if it was lower than average, it represents lower achievement motivation in an individual.

T0 each question of this questionnaire (Observation checklist to examine physical variables of coloring the learning environment), the minimum score (0) and maximum score (2) were assigned, in the other hand:

(0): If the school has not met the standard principles at all in the studied component (non-standard);

(1): If the school has met the standard principles relatively in the studied component (semi-standard);

(2): If the school has met the standard principles fully in the studied component (standard).

Given the number of questions in observation checklist (5), the minimum

score obtained by each school (completely non-standard), and the maximum obtained score by in terms of studied components, researcher marks each item in terms of meeting the standards according to three standard option of standard, semi-standard and non-standard.

According to the observation checklist, standard schools were those schools which required the min score based on confirmation of modernization, development and equipping of schools organization.

2-5. Data analyses

Data of study were analyzed using descriptive statistics (frequency, percentage, mean, standard deviation) and inferential statistics (factor analysis, t-test, Kolmogorov - Smirnov test and one-way ANOVA analysis) at SPSS- 21 software. In this section, the descriptive statistics related to observation the checklist to examine the impact of physical variables of coloring the educational space on learning and achievement questionnaire of students was provided. Then, statistical hypotheses were examined in the data analysis section.

To examine the normal distribution of data, Kolmogorov-Smirnov test was used. Then, to examine the hypothesis of study, structural equation and Pearson correlation coefficient were used, while single-sample t-test, independent two-sample t-test and ANOVA were used to examine the sub-hypotheses of study.

4-RESULTS

For investigating students' amount of learning and academic achievement (including 29 questions of 4 options), the Hermans' standard questionnaire was used as a research tool and for studying physical variables of coloring of educational spaces (including 5 questions of the standard, semi-standard and non-standard of 3 options) a researcher-made questionnaire; given the age of the respondents, the

method of interview was used in completing questionnaires. By completing questionnaires and interview, some parents or teachers of students were also present. Of total 210 population samples under study, 11 (5.2%) students were from elementary second grade, 38 (18.09%) third grade, 63(30%) fifth grade and 73(34.7%) of students were sixth grade, respectively.

Also in terms of age characteristics of the students under question, 15 (7.1%) students were 7-year old, 21 (10%) 8-year old, 38 (18.09%) 9-year old, 63(30%) 10-year old, and 73(34.7%) of students were11-year old, respectively. For investigating the normality of the distribution of data related to the coloring of educational spaces, amount of learning and academic achievement, in (Table.1) that the Kolmogorov-Smirnov test (by accepting the null hypothesis at the error level of 5%) has been used. Results showed that the mean of coloring of educational spaces was 0.782 ± 0.641, learning 0.34 ± 1.04 and academic achievement 0.42 ± 1.09, respectively.

In (Table.2), regarding 5 questions related to the check-list of variables of educational spaces coloring with three options standard, medium and non-standard, the amount of point and score of students has been stated. The first question asked whether the color of the walls in the educational space is clear or opaque. 18(8.57%) students have selected the standard option, 25(11.9%) students the medium option and 79(37.6%) of students selected non-standard option. The mean and standard deviation of this question have been 1.08 ± 3.36.

The second question asked whether the color of ceiling of educational spaces is white or bright; 16 (7.6%) individuals have selected the option standard, 21(10%) individuals the option medium and 79 (37.6%) individuals the option non-

standard. The mean and standard deviation of this question have been also 1.07±3.44.

The third question asked whether the color of doors of educational spaces is more opaque than walls; 28 (13.3%) individuals chose the option standard, 33 (15.7%) the option medium and 110 (52.3%) of individuals chose the option non-standard. The mean and standard deviation of this question have been 1.02±2.95. The fourth question asked whether the color of tables and chairs of classroom is opaque; 23(10.9%) individuals chose the option standard, 31 (14.7%) the option medium and 103 (49.04%) of individuals chose the option non-standard, respectively. The mean and standard deviation of this question have been 1.05±3.10.

The fifth question asked whether the color of board of classrooms is appropriate and "preferably" dark green or white; 16 (7.6%) individuals selected the option standard, 54(25.7%) the option medium and 90(42.8%) of individuals selected the option non-standard, respectively. The mean and standard deviation of this question have been also 1.03±3.22.

In (Table. 3) the good fitness test of Chi-square and the observed and expected frequency have been shown from perspective of the students under question. Results showed that the amount of Chi-square test was 22.58 and degree of freedom 2 with a significance level 0.001 was of error level is less than the error level of 0.05; so we accept the difference between the observed frequency and expected frequency and consider the test significant. Since the Chi-square test is influenced by the highest frequency (at least with 101 [48.09%] individuals), then we conclude with confidence of 95% that from the perspective of elementary school male students of Ahvaz, coloring of educational space had shown a moderate effect on their learning and academic achievement. Also in this research there was not observed any relationship between the demographic variables under investigation such as age, education level, education district of education place and the amount of learning and academic achievement ($P = 0.001$).

Table 1: Examine the normal distribution if data

Variables	Z Kolmogorov – Smirnov statistic	P- value
Educational Spaces Painted	0.782	0.641
Degree of learning	1.04	0.34
Educational achievement	1.09	0.42

Table 2: Frequency and percentage of respondents determine the Impact of Educational Spaces Painted on Learning and Academic Achievement

Questions	Response			Mean+SD	P-value
	Standard (n, %)	Moderate (n, %)	Non-standard (n, %)		
Walls are light color and matte	18(7.6)	25(10.5)	79(33.3)	3.36+1.08	0.824
Roof of class is white or light	16(6.8)	21(8.9)	79(33.3)	3.44+1.7	0.794
Doors are darker than walls	28(11.8)	33(13.9)	110(46)	2.95+1.02	0.774
Color of desks and chairs in class is matte	23(9.7)	31(13.1)	103(43.5)	3.10+1.05	0.732
The color of class board is appropriate, preferably dark green or white	16(6.8)	34(14.3)	90(38)	3.22+1.03	0.714

Table 3: Chi-square goodness of fit test and observed and expected frequency

Variables		Observed frequency	Expected frequency	Remaining	P-value
Students' perspective	Standard	45	79	-34.0	0.001
	Moderate	93	79	22.0	
	Non-standard	71	79	12.0	
	Total	210			

4- DISCUSSION

Results indicated that educational space painted has moderate impact on learning and academic achievement of elementary school children in Ahvaz. Therefore, we can say that the results of the current study are in line with results of other studies conducted by Gaines et al.(6), Lewinski et al. (15), Dockrell et al. (16), David et al. (22) Elliot et al. (23), Stone (24), Gifford (25), Fisher et al. (26), Gilliam (27), Gimbel (28), Imhof (29), Boyatzis et al.(30), Karp et al.(31),O'Connor et al.(32) and Terwogt et al.(33); while it was not consistent with results of study conducted by Moeinpour et al. (14).

The effects of exposing people to particular colors have always intrigued scientists. Color most certainly affects our experience of the world. For instance, an ongoing debate concerns the peculiarly named color "baker-miller pink", which is purported to lower stress and anxiety levels, as well as affecting physiological functions e.g., reducing blood pressure and pulse rate (34-36). Gilliam and Unruh (27) noted that the results of studies on baker-miller pink were incongruent with each other. Therefore, Gilliam and Unruh(27) investigated the topic themselves, finding no significant differences between people's experience and reactions to ordinary white walls and the more unusual baker-miller pink walls.

Elliot et al. (23) exposed participants to the colors red, green, or black before giving them a test; they found that exposure to red, even if participants were not consciously aware of the exposure, impaired their academic performance. The effect was found even when a number was written in red ink on top of a sheet of paper. Greater right frontal hemisphere Electroencephalogram (EEG) activation was found when students were exposed to red, which is consistent with similar findings of greater activation in right frontal relative to the left frontal cortex following exposure to the color red (23).

Another argument for the negative effects of the color red pertains to findings by Gimbel (28) and Pile (37), which are summarized in a table as part of their research paper (23). Notably, these authors suggest that the color green is best for classrooms. Gimbel (28) and Pile's (36) table also suggests which colors might be responsible for specific student behaviors. For example red-alert, increased pulse, activity; green-balance, judgment, arrested movement, stasis. However, in his book on environmental psychology, Gifford (25) argues that performance on math and reading tests did not vary among students who performed in classrooms with different colored walls. In a brief review of how to design effective study environments, Stone (24) highlights the lack of a clear relationship between color and mood (working from the assumption that mood is directly connected to performance). Based on a review of dozens of studies, Stone observes that if any relationship does exist, the most likely associations are red and yellow colors with stimulation and blue and green colors with calming effects. Stone also found out that color did have an impact on qualitatively different tasks (math task versus reading task). The color of the surrounding

environment affected performance on more difficult tasks, i.e., the reading task. A further finding was that the lowest performance on cognitively demanding tasks was in classrooms with red walls (24). Lewinsky et al. in a study entitled effects of classrooms' architecture on academic performance in view of telic versus paratelic motivation considered the negative impact of noise on student learning in 2015 they concluded that preference for a learning environment that cues a telic motivation state in the students (15).

5-1. Recommendations

Finally, seven recommendations were provided as follows:

1. It is recommended that schools of climate 1 to be colored based on proposed panel color of this study.

2. It is recommended that this study carried out in other regions of the country to determine what is the appropriate color for educational environment of other climates? 3. It is recommended this study to be re examined within specified period (for example, 5-year) so that color recommendations to be changed, if any change was observed in results.

4. Due to relationship between components of light and sounds of educational spaces and increased behavioral disorder among students, it is recommended that educational managers of country pay attention to psychological advices on colors and sounds.

5. It is recommended that particular attention should be paid to educational space of schools in terms of designing and building. The physical environment spaces should be designed and built so that they can be compatible with inherent tendency and nature of students. In addition, solutions should be found for educational spaces requiring major repairs.

6. As standards and criteria determine the desired level, and since the desired level of one region might be different from other region, it is recommended that a committee to be established to assess the internal situation of schools in Ahvaz so that it can determine the desired standards and criteria and schools to assessed accordingly.

7. It is required that higher attention to be paid on ergonomic relationship with behavioral disorders in students since the beginning of pre-school education and conduct the assessment plan to detect children who have particular needs and attempt to organize children with behavioral disorder.

6- CONCLUSION

Color of spaces and educational facilities is very important in schools due to age and physical condition of children and adolescents, because issue is effective in vitality, mental peace, mobility and efforts of students, improving the learning process. On other hand, it can result in boredom, inaction, anger, anxiety and depression. In fact, one of the most important places that it must be viewed from different angle is educational space of schools, especially elementary schools as memory construction process begins since childhood. However, a serious shortcoming can be seen in this regard, unfortunately. Regardless of a few exceptions, it has not been considered at al. At most, our schools pay attention to safety and engineering, but the art and psychology experts who have valuable experience in this field are not allowed to provide consulting and implementation in our educational spaces. Due to fact that our children at all ages make relationships with the colors and begin to visualize, the beginning of memory construction by colors is shaped since their infancy. The first babies' encounter with world is done through colors. Therefore, to make this

encounter pleasant requires cheerful colors. That is why many manufacturers of toys and children's vehicles show great attention to this issue nowadays, because the initial experiences of child with colors has profound effect on his mind and it can provide valuable storage for later years.

7-CONFLICT OF INTEREST: None.

8-REFERENCES

1. Aghazadeh, M, Fazli, R, Educational instructions in classrooms of various grades, Tehran: Aeish; 2005;111-12.

2. Mirkamali SM. Management in school. Journal of Education Management 2007; 4(4): 4-11.

3. ShahriariAhmadi M. Human Factors Psychology. Tehran: Zarbaf Asl; 2007;198-199.

4. NavidAdham M. School message. Tehran: School Publications; 2003;125-27.

5. Afrouz Gh. Education of Exceptional Children, Tehran: Tehran University Publications; 2005; 201-202.

6. Gaines KS, Curry ZD. The inclusive classroom: The effects of color on learning and behavior. Journal of Family and Consumer Sciences Education 2011; 29(1), 46-57.

7. Gilavand A. Investigating the Relationship between Mental Health and Academic Success of Students in Ahvaz Jundishapur University of Medical Sciences. Persian Journal of Medical Sciences 2015; 2(3): 38-50.

8. Gilavand A, Espidkar F, Fakhri A. A comparative evaluation of depression and anxiety rate among native and non-native students of Dentistry School at Ahvaz Jundishapour University of Medical Sciences. Journal of Medical Science Educational Development Center 2015; 6(2): 186-90.

9. Gilavand A, Barekat Gh, Hosseinpour M. Evaluation of Dental Students' Motives and Viewpoints on their Career Choice in Ahvaz. Jentashapir Journal of Health Research 2015; 6(6): 45-9.

10. Hosseini Nasab D, Adib Y, Omrani L. Investigation of current status of physical space and educational facilities secondary education schools in Tabriz according to the standards of development program of country in the academic year 2009-2010. Quarterly of Education and Evaluation 2015; 6(21): 13-25.

11. Malakootian M, Akbari H, Nekoei-Moghadam M, Parizi A, Nekounam GH. Investigation of Environmental Health Condition and Safety of Schools in Kerman in 2007 Tolooe Behdasht 2007; 7(3,4):1.

12. Shojaeean A, Maleki S, Omidipoor. Metropolitan Educational placement using Boolean Logic and Fuzzy multi variance decision making method. Education planning study 2013; 2(4): 137-166.

13. Zamani B, Nasreesfahani A. Physical and cultural features of educational spaces in four countries the modern world from the perspective of Iranian students and their parents. New Educational Approaches 2008; 6(23): 55-84.

14. Moeinpour H, NasreEsfahani H, Saedi E. Impact of Physical factors on student achievement in educational and psychological studies 2004; 1(4): 54-76. Available at http://www.ensani.ir/fa/content/39071/default.aspx.

15. Lewinski P. Effects of classrooms' architecture on academic performance in view of telic versus paratelic motivation: a review. Front Psychol 2015; 6: 746.

16. Dockrell JE, Shield B. The impact of sound-field systems on learning and attention in elementary school classrooms. J Speech Lang Hear Res 2012; 55(4):1163-76.

17. Wagemans J, Elder JH, Kubovy M, Palmer SE, Peterson MA, Singh M, et al. A century of Gestalt psychology in visual perception: I. Perceptual grouping and figure–ground organization. Psychol. Bull 2012; 138(12):1172-17.

18. Zannin PHT, Engel MS, Fiedler PEK, Bunn F. Characterization of environmental noise based on noise measurements, noise mapping and interviews: a case study at a university campus in Brazil. Cities 2013; 31(7):317-27.

19. Zannin PHT, Passero CRM, Zwirtes DPZ. Assessment of acoustic quality in classrooms

based on measurements, perception and noise control, in Noise Control, Reduction and Cancellation Solutions in Engineering. ed. Siano D, editor. Rijeka: In.Tech - Open Access Publisher; 2012.

20. Biabangard E. Dropout prevention methods.Tehran: Publication of PTA; 2005; 109.

21. Akbari B. Validity of motivation questionnaire of Heremence on students of high school in Guilan Providence knowledge and research in educational sciences 2007;16:73-96.

22. David B. Zandvliet, Barry J. Fraser. Physical and Psychosocial Environments Associated with Networked Classrooms Article. Learning Environments Research 2005; 8(1):1-15.

23. Elliot AJ, Maier MA, Moller AC, Friedman R, Meinhardt J. Color and psychological functioning: the effect of red on performance attainment. J. Exp. Psychol. Gen 2007; 136(6):136-54.

24. Stone N. Designing effective study environments. J Environ Psychol 2001; 21(6):179-90.

25. Gifford R. Environmental Psychology. Colville, WA: Optimal books; 2007.p.191-6.

26. Fisher K. Research into identifying effective learning environments. Evaluating Qual. Educ. Facil 2005; 9(4):159-67.

27. Gilliam J E. Unruh D. The effects of baker-miller pink on biological, physical and cognitive behaviors. Journal of Orthomolecular Medicine 1988; 3(4): 202-6.

28. Gimbel T. Healing with Colour. London: Gaia; 1997; 1(1):135-44.

29. Imhof M. Effects of color stimulation on handwriting performance of children with ADHD without and with additional learning disabilities. European Child and Adolescent Psychiatry 2004; 13(1):191-8.

30. Boyatzis CJ, Varghese R. Children's emotional associates with colors. The Journal of Genetic Psychology 1993; 155(1):77-85.

31. Karp EM, Karp HB. Color associations of male and female fourth-grade school children. The Journal of Psychology 2001; 122(4):383-88.

32. O'Connor PD, Sofo F, Kendall L. Olsen, G. Reading disabilities and the effects of colored filters. Journal of Learning Disabilities 1990; 23(10):597-603.

33. Terwogt MM, Hoeksma JB. Colors and emotions: preferences and combinations. The Journal of General Psychology 2001; 122(1):5-17.

34. Profusek PJ, Rainey DW. Effects of baker-miller pink and red on state anxiety, grip strength, and motor precision. Percept Mot Skills 1987; 65(3):941-42.

35. Schauss AG. The physiological effect of color on the suppression of human aggression: Research on Baker-Miller pink. Int. J. Biosoc. Res 1985; 2(3):55-64.

36. Bennett CP, Hague A, Perkins C. The use of Baker-Miller pink in police operational and university experimental situations in Britain. Int J Biosoc Med Res 1991; 13(4): 118-27.

37. Pile J. Colour in Interior Design. New York, NY: McGraw-Hill; 1997. p. 69-112.

38. Schauss AG. The physiological effect of color on the suppression of human aggression: Research on Baker-Miller pink. Int. J. Biosoc. Res 1985; 2(3):55-64.