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Original Article (Pages: 10689-10704)

Investigation of Physical Factors Affecting the Wayfinding of Educational Spaces Children aged 7-12 years old in Rasht, North of Iran

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Abstract

Background
Wayfinding involves behavior in order to navigate between the two points of origin and destination. The importance of this issue is considerable; because facility of wayfinding is directly related to improving the efficiency of space, and its psychological effects on human life. This study focuses on the effective physical factors in the wayfinding of educational spaces for children.

Materials and Methods
The research method has been applied qualitatively and quantitatively. Data collection was done using sketch maps in January 2019. So that, from two primary schools in Rasht, which had a total of 299 primary students 168 sketch maps were collected from the students of different sections using the Cochran formula. It should be noted that for analysis of the research findings, MAXQDA 10 and SPSS 24 software were also used.

Results
The findings of this research indicate that in the age group of 7-8 years-old parks and playgrounds, in the age group 9-10 years-old green space, and in the age group of 11-12 year-old, entrance signage and navigation boards, were the most important signs in the wayfinding of children into educational spaces. Also, the results showed that there was no significant difference between different groups and the variances are homogeneous.

Conclusion
Components such as scale changes, the use of cheerful colors, architectural distinctions, the use of textures that fit children's character for materials, such as hearts, stars, or animation characters, graphic and fantasy signs and symbols are suitable stimulants for wayfinding of children aged 7-12 year-old into educational spaces.

Key Words: Children, Cognitive Map, Educational Space, Mental Image, Wayfinding.

*Please cite this article as: Rezaei Liapaee S, Askarizad R, Alborzi F. Investigation of Physical Factors Affecting the Wayfinding of Educational Spaces Children aged 7-12 years old in Rasht, North of Iran. Int J Pediatr 2020; 8(1): 10689-704. DOI: **10.22038/ijp.2019.14063**

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Received date: Aug.10, 2019; Accepted date: Dec.12, 2019

1- INTRODUCTION

Wayfinding is the process of reaching a specific destination (1), and it is defined as the organization of relationships between human and the environment (2). In this process, finding the destination takes into account the effects of different factors (3). This is an activity that requires being fully integrated with its environment (4). During this integration, audiences seek to understand the information they receive from the environment. The wayfinding design process consists of a set of information that is employed among users and the environment to reach the intended destination and enhance the sense of orientation among users (5). Studies have shown that if the wayfinding process is not easily carried out, it leads to stress and confusion among people (6).

In the meantime, considering the difference in mental and physical scales of children compared to adults, their perception of the cognitive maps will also be different (7). As the age of children grows, awareness of the route also grows rapidly (8). As the age increases, children also get more information about their locations and paths, and their ability to understand environmental changes will be increased (9). Children aged 7 have a two-dimensional vision of their environments (10). Meanwhile children aged 10 to 12 have higher levels of self-confidence in order to navigate their intended destination (11). Landmarks and urban elements play an important role in developing children's abilities to navigate and recognize environmental spaces (12).

The age group selected in this study is from the third stage of child development, aged 7 to 12 years old. According to developmental psychological theory of Jean Piaget, this stage is a period of objective operations in which children have the ability to subjectively visualize objects and locations individually and they are more knowledgeable about using guides and identifying objects and places and they learn to classify and categorize objects according to their common characteristics (13). Among the research methods in the field of child psychology, drawing is a suitable method for assessing children's mentality and is considered as an appropriate instrument to illustrate a part of the child's existence and is a way to discover their mysterious world (14) which can lead us to having an assessment of children's perceptions from the environment (15). Hence, the drawing technique is used to communicate between children and scholars and to clarify the information and understand of the child's language, in order to access credible and reliable data as a suitable method (16). Numerous studies have validated this method (17-21).

Since most of the time of children in this age group is spent in the educational settings, the range of student's satisfaction with the educational setting relies on the amount of architectural components perception from the environment. With the cognition and perception of the path, children can be more relaxed and more satisfied in this influential center; so that the desirability of the route and the wayfinding process will play an important and effective role in the efficiency of space. Researcher, by choosing primary schools as physical context of the research seeks out how the type of information is formed in the child's mind in the process of wayfinding the environment. So that by using mental and cognitive maps and extracting factors affecting the creation of optimal mental images in the wayfinding process, it becomes possible to create a proper mechanism for architectural design, in order to reduce concerns about loss of space, stress and its consequences. In this way, the following questions have been posed so that appropriate answers can ultimately be obtained:

1. What kind of physical and semantic components of the architectural environment are effective on improving the quality of children's wayfinding?

2. What are the effective stimulants for creating the optimal mental and cognitive map of 7-12 year- old children?

It also seems that the elements that lead to physical and semantic distinctions are effective in the wayfinding process of children aged 7 to 12 in the educational settings and factors such as changing the scale, architectural differences and color of the graphical signs are the main components of the mental and cognitive map of the children aged 7-12 year-old (**Figure.1**).

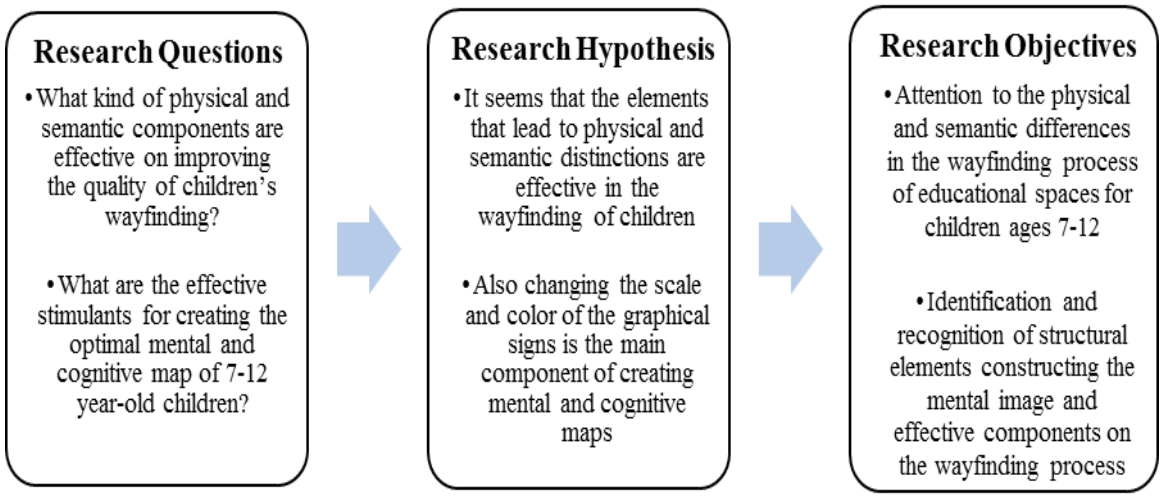


Fig1: Research Structure (by Authors).

1-2. Literature Review

The history of studies in the context of wayfinding has considerable background. For the first time, Kevin Lynch (1960) addressed the impact of spatial legibility on facilitating navigation (7). Studies show that if the environment can differentiate itself from its surroundings by the elements, spaces can be easily understood regardless of people's familiarity with the environment (8). Subsequent studies have contributed to the impact of environmental and individual studies for a better understanding of the wayfinding process. Some findings suggest that knowledge gained from cognitive map will not always lead to increased familiarity with the environment (9). Rather, it is influenced by factors such as environmental legibility (10, 11), and spatial orientation (12). It should be noted that in terms of the process of acquaintance with the wayfinding process, its various aspects have been discussed and analyzed in the literature review section of the research, and based on expedience, different results have been deduced. Weisman (1981), in his paper "Evaluating architectural legibility: Way-finding in the built environment" states that complexity in design is one of the primary causes of problems in wayfinding and this asymmetry is highly correlated with complexity in design (13). Recent research on wayfinding has focused more on general features and the role of landmarks in urban spaces (14-16, 22-27). Other research has been on studies based on age (28, 29), gender (30, 31), color and

materials diversity (32, 33), geometry (34), or architectural interiors such as hospitals, airports, shopping malls and libraries (35-38). There has also been a lot of research on children's wayfinding, which is briefly described below. These include research on "Young Children's Representations of the Environment: A Comparison of Techniques". In this study, children aged 6 to 11 years were asked to describe the process of their journey from home to school in the form of verbal descriptions and large-scale aerial designs. The findings suggest that the way children were presented with spatial descriptions as drawing and sketch maps had better details in understanding the wayfinding concepts and verbal description strongly reduced their understanding from the concepts of the wayfinding process (39). In a study titled "Differential Use of Landmarks by 8 and 12 Year Old Children during Route Reversal Navigation", investigation has been given to the importance of landmarks in the wayfinding process of children, the results of which show that the use of urban landmarks in the wayfinding process of children increases markedly as they age (40). In another study, it was investigated in a cross-cultural study in order to examine the ability of wayfinding and mapping in 4-5 year-old children.

The results of studied cases in England, South Africa, Iran, Mexico, and the United States showed that essential mapping abilities are well developed by the age of four in these cultures, and mapping abilities emerge without training in very young children of all cultures (41). Another study examines the role of color on the wayfinding of children to school environments and measured color differences in learning and wayfinding of children 7-8 year-old. The results show that color also has a significant impact on children's performance in the navigation of educational spaces. However, there was no difference between different colors in recalling different paths from the children's point of view (32). In a research titled "Comparison of Children's Wayfinding, Using Paper Map and Mobile Navigation", in Slovenia it was shown that children make fewer mistakes when using a global positioning system rather than paper maps (42). In another study examining the factors affecting the wayfinding of children with Down syndrome, it was found that parents' role in education, upbringing and behavior appropriate to their emotions can be considered as the most important factors in the wayfinding of these children (43). In their research Fang and Lin (2017), investigate about how children's travel modes influence the development of their spatial cognition, specifically the development of their spatial representation of home-school routes using questionnaire survey and a cognitive mapping process at an elementary school in northern Taiwan. Empirical results indicate that the use of independent, active or non-motorized transportation modes improved the children's spatial cognition regarding their home–school routes (44).

In another study in the UK, the wayfinding analysis of children aged 8 to 12 was tested using a virtual environment in a complex path with 12 intersections. The results showed that by placing a special sign at each intersection many children could find the ways very quickly without the need for repeated experience (45). Nieścioruk (2019), in his research investigates cognitive mapping of the teen students in Poland. The results of this study indicate the significant role of landmarks and historical buildings in the cognitive mapping of the age group of 15-19 (27). Burles et al. (2019), investigated the ability of the children to orient their way using a video game with the aim of reaching the target as quickly as possible. The results indicated that children aged 7 and 8 year-old were less effective than

older children and adults in using shortcuts. The evidence revealed that a distinct developmental change in children is shaped around the age of 9 year-old to proficiently orient and navigate their way using their cognitive maps (46). In this research, the effective physical factors in the wayfinding of educational spaces for children aged 7 to 12 year-old were investigated.

2- MATERIAL AND METHODS

2-1. Study design and population

The present study has been carried out in primary schools of Rasht, Iran, in two different educational zones. The sample population was selected by a relative categorized sampling method from two primary schools in Rasht (Elm-Afarin and Sepas Primary School) that were similar in quality and physical facilities level of education according to the query. These two schools have a total of 299 elementary students and, according to the Cochran formula, 168 sketch maps were obtained from the two schools based on the requirements.

2-2. Methods

The research method has been applied qualitatively and quantitatively. In this process cognitive sketch maps have been used for data collection. The method of data collecting is that participants are asked to draw a sketch map from their own house entrance to a known place such as the entrance of their school or classroom. In the first stage, as a pre-test, a small sample of the statistical population experimented with this method, and the results showed that some of the sketch maps did not have sufficient clarity for analysis; specifically for the age group of 7-8 year-old. Therefore, students were asked to write their comments in separate sheets for a proper understanding of children's drawings and the Art teacher provided mental readiness about the subject matter in the classroom to the audiences. However, due to the simple and succinct components of the route, attempts were made to avoid giving any concept that might lead to an idea in the drawing process. It was also suggested that students close their eyes before drawing the sketch map and then visualize their pathway to the classroom to provide an opportunity for their subconscious to develop their drawing.

2-3. Measuring tools

The present research is a descriptive-survey study that uses descriptive data collected using library method and descriptive data measurement tool is an in-depth interview using sketch drawing method which is analyzed by inductive reasoning method. It should be noted that MAXQDA 10, Microsoft Excel 2010 and SPSS 24.0 software have been used to analyze the research findings. A total of 168 sketch maps were received from two schools in the study area of Rasht. The MAXQDA 10.0 software was used to qualitatively analyze the data of children's sketch maps. The data analysis process in this software, unlike quantitative analysis software such as SPSS, is not done exclusively by the software.

Rather, the data from the sketch maps are systematically and logically searched and organized, and based on existing algorithms, some of the information that is more emphasized and more relevant is identified to help the researcher analyze the data more precisely by categorizing and extracting the obtained information. In this study, the paintings were categorized as basic descriptive codes. In the classification of image codes (sketch maps) various topics such as attention to green space, buildings facades, playgrounds, urban parks, streets, school yard and such factors on the way to school have been taken into consideration and were coded in the mentioned software.

Then similar codes were placed in their own classification and compared with each other. It should be noted that, since the sample population in this study are children from 7 to 12 years, we tried to categorize the findings in three groups of first and second grade (7 and 8 years old), third and fourth grade (9 and 10 years old), fifth and sixth grade (11 and 12 years old); because these children have different abilities in drawing techniques and in the way they express their mental image of their way to school. Therefore, by classifying these children into different age groups, any contradictions in the findings will be avoided. Finally, Shapiro Wilk test was used to check the normality of the data and also, one way ANOVA test was used in order to compare different groups with each other using Scheffe follow-up analysis by SPSS 24. Some examples of children's sketch maps in different age groups are presented in the form of Tables (**Tables 1-3**).

2-4. Intervention

The moderator and intervening variables of the schools' qualitative level such as gender, age group and social level of schools have been considered by the scholars in the school selection process. One of the intervening variables that can be noted is that children sketch maps are different, not only because their cognitive maps are different, but also because of their different ability to draw perspective, scale and type of map such as spatial, hierarchy, etc.

2-5. Ethical consideration

Ethical considerations in this study include voluntary participation of respondents, avoidance of offensive, discriminatory, or other unacceptable language in data collection, privacy of the respondents, and maintenance of the highest level of objectivity in discussions and analysis, have been regarded throughout the research process.

2-6. Data Analyses

From the sample population, 54 Sketch maps from the first and second grade, 60 Sketch maps from the third and fourth grade and 54 Sketch maps from the fifth and sixth grade have been collected. Based on the findings from the children's sketch maps, 10 physical and semantic components were identified as their own cognitive map on their way to school. These signs include: 1- Street, 2- Pedestrian sidewalk, 3- Urban furniture, 4- Flag, 5- Attention to the materials' texture, 6- Building façade, 7- Entrance façade, 8- Parks and playgrounds, 9- Green space including grass, flowers, plants and trees, and 10- Vehicular traffic.

Table-1: Examples of the sketch maps in the age group of 7 and 8 year-old which were analyzed by MAXQDA 10.0.

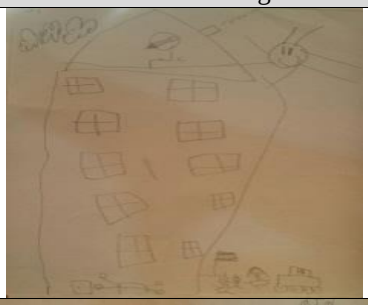
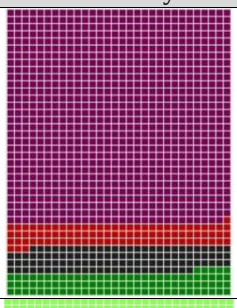
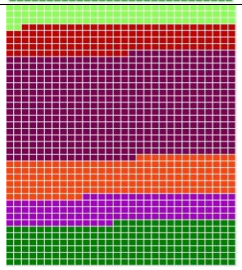
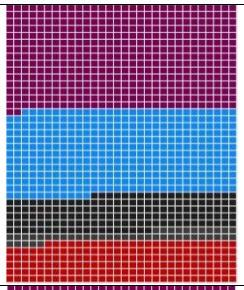
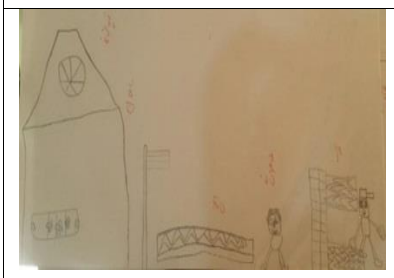
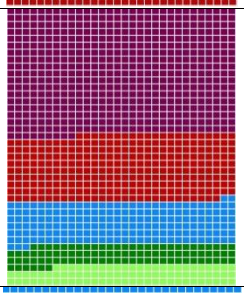
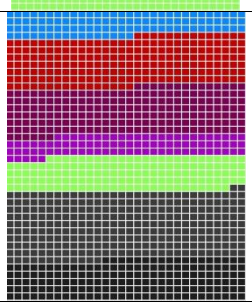
Sketch Drawing	Age Category	Description	Visual Analysis
	First Grade (Age 7 years old)	Signs used in painting: 1- Building Facade (Purple) 2- Flag (Red) 3- Vehicular Traffic (Black) 4- Children's Playground (Green)	
	First Grade (Age 7 years old)	Signs used in painting: 1- Green Space (Light green) 2- Flag (Red) 3- Building Facade (Purple) 4- Walking Path (Orange) 5- Entrance Facade (Magenta) 6- Children's Playground (Green)	
	First Grade (Age 7 years old)	Signs used in painting: 1- Building Facade (Purple) 2- Materials' Texture (Blue) 3- Vehicular Traffic (Black) 4- Street (Gray) 5- Flag (Red)	
	Second Grade (Age 8 years old)	Signs used in painting: 1- Building Facade (Purple) 2- Flag (Red) 3- Materials' Texture (Blue) 4- Children's Playground (Green) 5- Green Space (Light Green)	
	Second Grade (Age 8 years old)	Signs used in painting: 1- Materials' Texture (Blue) 2- Flag (Red) 3- Building Facade (Purple) 4- Entrance Facade (Magenta) 5-Green Space (Light Green) 6- Street (Gray) 7- Vehicular Traffic (Black).	

Table-2: Examples of the sketch maps in the age group of 9 and 10 year-old which were analyzed by MAXQDA 10.0.

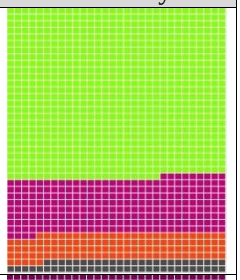
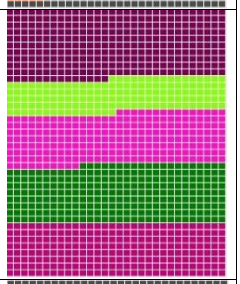
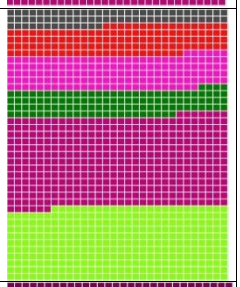
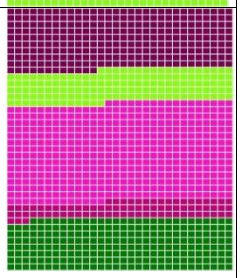
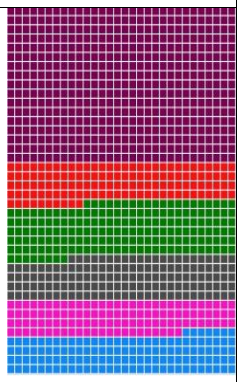
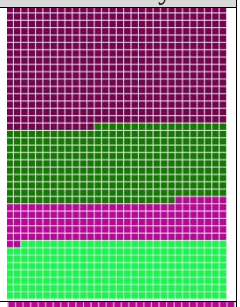
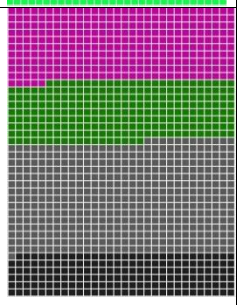
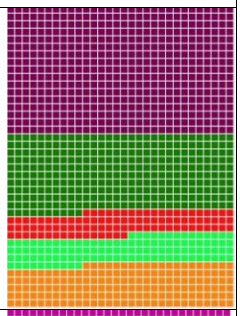
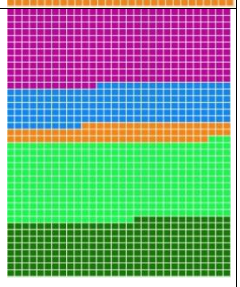
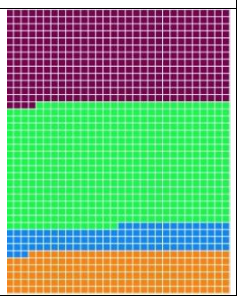
Sketch Drawing	Age Category	Description	Visual Analysis
	Third Grade (Age 9 years old)	Signs used in painting: 1- Green Space (Light Green) 2- Entrance Facade (Magenta) 3- Walking Path (Orange) 4- Street (Gray)	
	Third Grade (Age 9 years old)	Signs used in painting: 1- Building Facade (Purple) 2- Green Space (Light Green) 3- Urban Furniture (Pink) 4- Children's Playground (Green) 5- Entrance Facade (Magenta)	
	Third Grade (Age 9 years old)	Signs used in painting: 1- Street (Gray) 2- Flag (Red) 3- Urban Furniture (Pink) 4- Children's Playground (Green) 5- Entrance Facade (Magenta) 6- Green Space (Light Green)	
	Fourth Grade (Age 10 years old)	Signs used in painting: 1- Building Facade (Purple) 2- Green Space (Light Green) 3- Urban Furniture (Pink) 4- Entrance Facade (Magenta) 5- Children's Playground (Green)	
	Fourth Grade (Age 10 years old)	Signs used in painting: 1- Building Facade (Purple) 2- Flag (Red) 3- Children's Playground (Green) 4- Street (Gray) 5- Urban Furniture (Pink) 6- Materials' Texture (Blue).	

Table-3: Examples of the sketch maps in the age group of 11 and 12 year-old which were analyzed by MAXQDA 10.

Sketch Drawing	Age Category	Description	Visual Analysis
	Fifth Grade (Age 11 years old)	Signs used in painting: 1- Building Facade (Purple) 2- Children's Playground (Green) 3- Entrance Facade (Magenta) 4- Green Space (Light Green)	
	Fifth Grade (Age 11 years old)	Signs used in painting: 1- Entrance Facade (Magenta) 2- Children's Playground (Green) 3- Street (Gray) 4- Vehicular Traffic (Black)	
	Fifth Grade (Age 11 years old)	Signs used in painting: 1- Building Facade (Purple) 2- Children's Playground (Green) 3- Flag (Red) 4- Green Space (Light Green) 5- Pedestrian Sidewalk (Orange)	
	Sixth Grade (Age 12 years old)	Signs used in painting: 1- Entrance Facade (Magenta) 2- Materials' Texture (Blue) 3- Pedestrian Sidewalk (Orange) 4- Green Space (Light Green) 5- Children's Playground (Green)	
	Sixth Grade (Age 12 years old)	Signs used in painting: 1- Building Facade (Purple) 2- Green Space (Light Green) 3- Materials' Texture (Blue) 4- Pedestrian Sidewalk (Orange)	

4- RESULTS

The results of the analysis of the sketch maps show that in the first and second grade (age group 7 and 8 years) the most important signs for children are the parks and playgrounds, which have been used 35 times for children of this age group. Afterwards, the building facades with 32

times usage and the entrance facades with 31 times usage in the sketch maps were identified as the most important signs of pedestrian navigation in this age category (**Figure.2**). The main characteristic of the drawings of this age category is that most of the children present their mental image as abstract work. Therefore, in order to avoid misinterpretation of their mental images, they were asked to provide a brief explanation of their drawing in order to complete the analysis process.

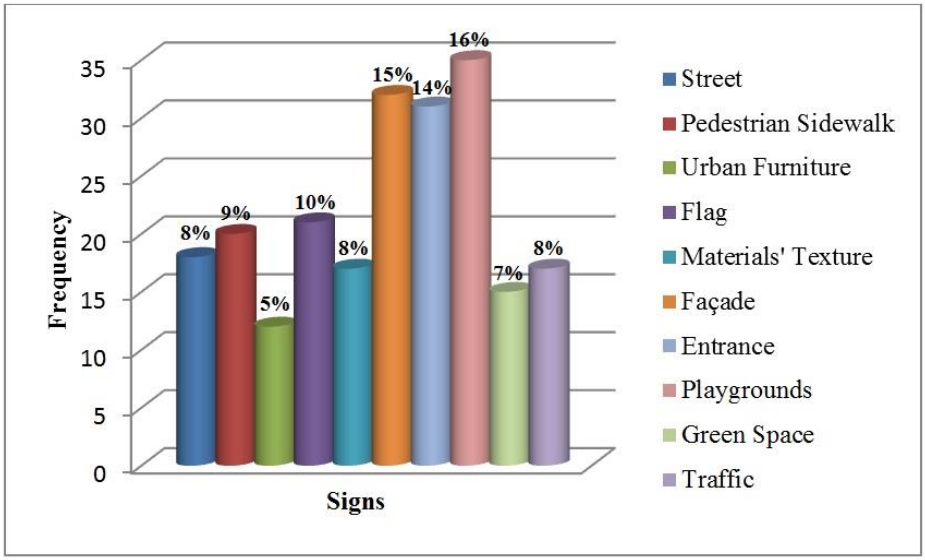


Fig.2: The frequency of signs used in sketch maps of children 7 and 8 years old.

In the next stage, the findings from the sketch maps of the third and fourth grade (age group 7 and 8 years), were analyzed. The analysis of the sketch maps shows that out of the 60 drawings collected, green spaces such as grass, flowers and plants, and trees with 36 times used in the works have been identified as the most important sign in the wayfinding of this age category. Subsequently, factors such as parks and playgrounds with 35 uses, entrance facades with 33 uses and urban furniture with 32 uses have been identified as the most important signs of the wayfinding in educational spaces (**Figure.3**). The characteristic of children's sketch maps in this age category is better understanding of the nature of spaces and a way to better express their mental image through painting, coloring and trying to identify perspective principles. Also, the results of the analysis of the sketch maps show that in the fifth and sixth grade (age group 11 and 12 years) the most important sign for children is the entrance façade, which has been used 34 times for children of this age group. Subsequently, factors like green space (such as: grass, flowers and plants and trees) with 31 uses, parks and playgrounds with 27 uses, and building facades with 25 uses, are the most important identified signs in wayfinding of children aged 11 and 12 years old (**Figure.4**). The characteristic of children's sketch maps in this age category is more attention to detail such as the texture used in materials, the more rational use of signage and declaration boards.

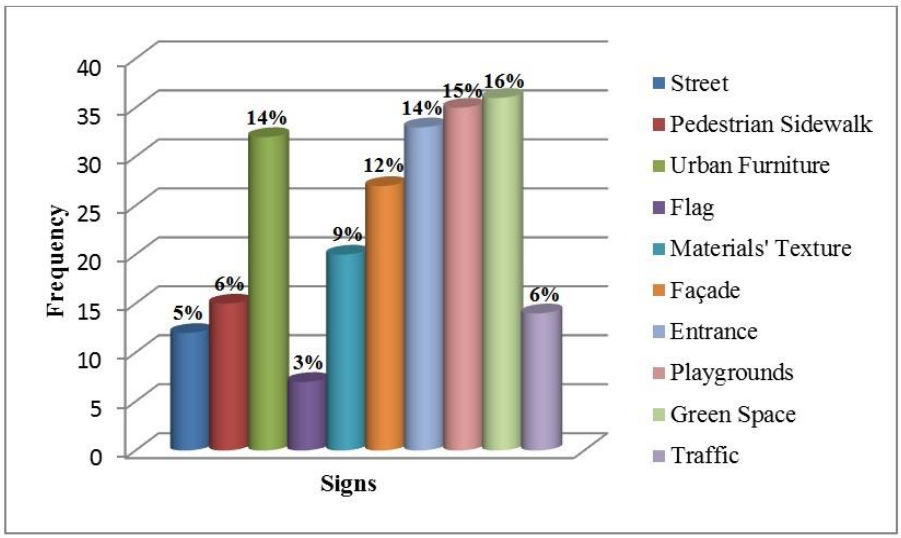


Fig.3: The frequency of signs used in sketch maps of children 9 and 10 years old.

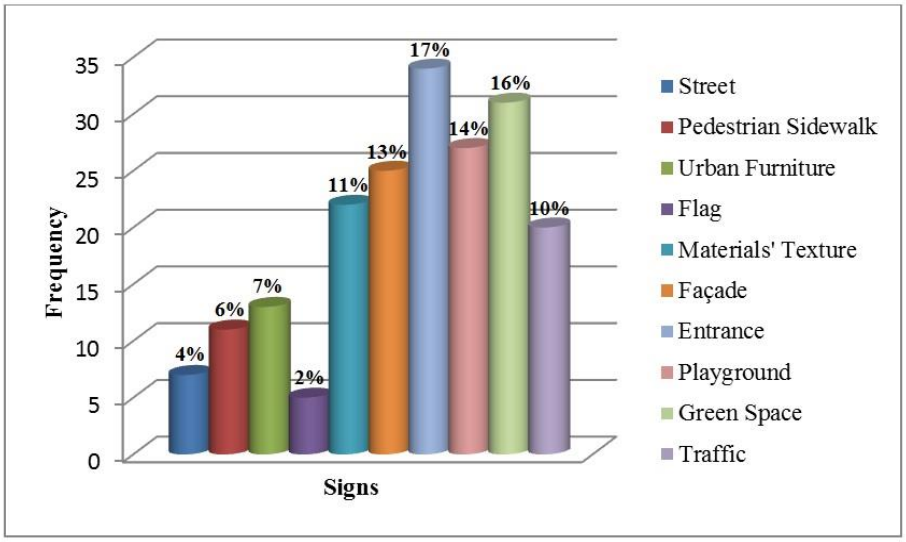


Fig.4: The frequency of signs used in sketch maps of children 11 and 12 years old.

The frequency of data obtained from the analysis of children's sketch maps in the age group of 7 - 8, 9-10, and 11-12 year-old is presented in **Table.4**. Comparison of the physical factors affecting the routing of children to educational settings indicates that in general the results in different age groups are close to one another and there is no significant difference between them (**Figure.5**). However, there are differences between the findings in different age groups that cannot be easily ignored. In the age group of 7 and 8 years-old, when children have recently graduated from preschool, most of the signs are parks and playgrounds, which shape their mental image in the wayfinding process. At the age of 9 and 10 year-old, the formation of children's personality and conceptual processes lead to better understanding and identification of spaces from cognitive maps. As their mental framework is separated from the playgrounds and entertainment spaces, they begin to identify environments with new capabilities. In the age group of 11 and 12 years, as children become more fluent in reading and writing, their attention is also directed to the signs and boards used to facilitate wayfinding.

Table-4: Frequency of signs used in the process of children's wayfinding to the educational spaces.

Signs	Age group of 7-8 years Number (%)	Age group of 9-10 years Number (%)	Age group of 11-12 years Number (%)
Street	18 (8%)	12 (5%)	7 (4%)
Pedestrian Sidewalk	20 (9%)	15 (6%)	11 (6%)
Urban Furniture	12 (5%)	32 (14%)	13 (7%)
Flag	21 (10%)	7 (3%)	5 (2%)
Materials' Texture	17 (8%)	20 (9%)	22 (11%)
Building Façade	32 (15%)	27 (12%)	25 (13%)
Entrance Façade	31 (14%)	33 (14%)	34 (17%)
Playgrounds	35 (16%)	35 (15%)	27 (14%)
Green Space	15 (7%)	36 (16%)	31 (16%)
Vehicular Traffic	17 (8%)	14 (6%)	20 (10%)

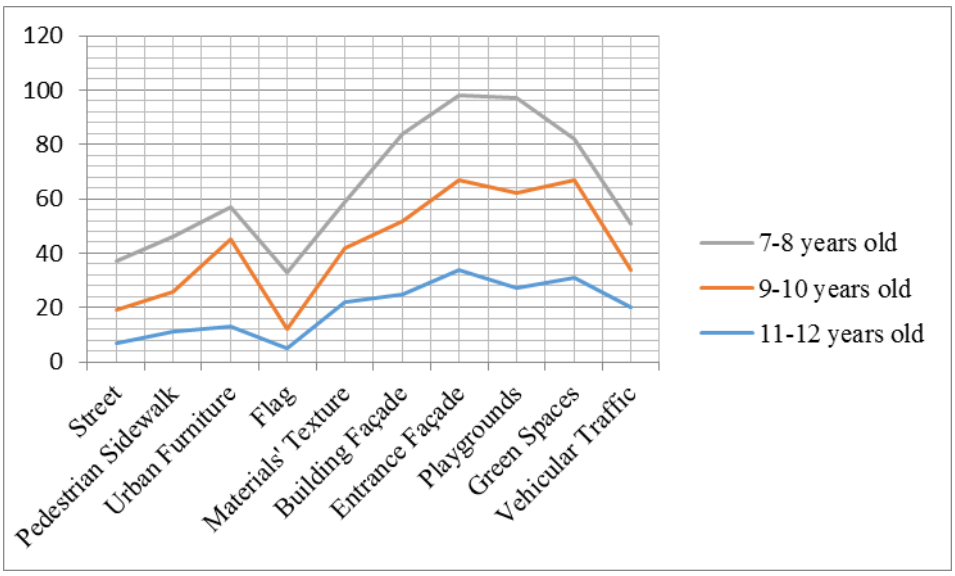


Fig.5: Comparison of peer-to-peer signs used in children's sketch maps.

The results of Shapiro Wilk test to check the normality of the data show that the level of significance in the age group of 7-8 year-old is 0.12, in the age group of 9-10 year- old is 0.23 and in the age group of 11-12 year-old is 0.67 and since these values are more than 0.05, it can be said that the data have a normal distribution. Therefore, the data can be measured and analyzed using one-way ANOVA. The results of one-way ANOVA and Scheffe follow-up analysis indicate that the significance level is higher than 0.05. Therefore, it can be said that there is no significant difference between different groups and the variances are homogeneous (**Table.5**).

Age group, year	Age Groups, year	Mean Difference	Significance Level	P-value
7-8	Age group 9-10	-1.3	0.95 > 0.05	0.12
	Age group 11-12	2.3	086 > 0.05	
9-10	Age group 7-8	1.3	0.95 > 0.05	0.23
	Age group 11-12	3.6	0.71 > 0.05	
11-12	Age group 7-	-2.3	0.86 > 0.05	0.67
	Age group 9-10	-3.6	0.71 > 0.05	

4- DISCUSSION

The main objective of this study was to investigate the factors affecting the wayfinding of educational spaces for children aged 7-12 years. This issue is considered important because the facility of navigation is directly related to its psychological impact on human life. The need to identify the spatial components that are effective in the routing design process that can improve spatial efficiency and performance can also be pointed out. Since the majority of children living in this age group are in the educational environment, the student's satisfaction with the educational environment depends on the number of spatial components that are affected by the environment. With the cognition and perception of the path, children can be more relaxed and more satisfied in this influential setting.

The results of the analysis of the sketch drawings show that in the age group of 7 and 8 year-old, when children have recently graduated from preschool, most of the signs are parks and playgrounds, which shape their mental image in the wayfinding process. At the age of 9 and 10 year-old, the formation of children's personality and conceptual processes leads to better understanding and identification of spaces from cognitive maps. As their mental framework is separated from the playgrounds and entertainment spaces, they begin to identify environments with new capabilities. In the age group of 11 and 12 years, as children become more fluent in reading and writing, their attention is also directed to the signs and boards used to facilitate wayfinding. Studies on the factors affecting children's wayfinding have been conducted by other researchers, such as: "A Cross-Cultural Study of Young Children's Mapping Abilities". The results of this study, which qualitatively examines children's mapping abilities, indicate that children at age four learn mapping abilities, understanding relationships, and spatial visualization (41). But in the present study, the factors affecting the wayfinding of children from 7 to 12 years old in educational settings was investigated. But in the present study, the factors affecting the wayfinding of children from 7 to 12 year-old in educational settings were investigated. Also, in order to compare the findings of other researchers with the present study, the findings of Helvacioglu and Olgunturk (2011) can be mentioned. Consistent with the findings of this study and while confirming the significant impact of color on children's wayfinding in educational settings, other effective components have also been analyzed in this regard (32). Other studies have also highlighted the significant impact of landmarks in urban spaces for facilities of children's wayfinding in general and have neglected to provide details (22, 24, 27, 40, and 45).

Whereas the signs for children that form their mental image are definitely different from those for adults and, according to the findings of this study, these signs tend to be in places where children have a sense of attachment and belonging to the place. Consistent with recent research that advocates the importance of developmental role of cognitive map by the age growth (40, 44, 46), the results of this study reveal that the formation of children's personality and conceptual processes that lead to better spatial comprehension and identification have been shaped from the age group of 9 and 10 year-old.

4-1. Study Limitations

One of the limitations that can be noted is that children's sketch maps are different, not only because their cognitive maps are different, but also because of their different ability to draw perspective, scale and type of maps such as spatial, hierarchy, etc. Accordingly, it was attempted to classify the statistical population into three different age groups

in order to differentiate either in terms of cognitive mapping or in the drawing skill within the analysis process. Furthermore, some of the sketch maps did not have sufficient clarity for analysis; specifically for the age group of 7-8 year-old. Therefore, students are asked to write their comments in separate sheets for a proper comprehension of children's sketch maps.

5- CONCLUSION

In conclusion, according to the findings of the study, it can be stated that a set of physical and semantic components are effective in shaping children's mental image in the wayfinding process of educational spaces. Accordingly, in the age group of 7 and 8 year-old, the main characteristic of the sketch maps is that most of the children present their mental image as an abstract work and the process of cognitive mapping has not been fully formed in their minds. In the age group of 9 and 10 year-old, the characteristic of children's sketch maps has better comprehension from the nature of spaces and a way to better express their mental image through painting, coloring and trying to identify perspective principles.

Also, the characteristic of children's sketch maps in the age group of 11 and 12 year-old has more attention to details such as the texture used in materials and the more rational use of signage and declaration boards. Based on the findings, factors such as playgrounds, green spaces, entrance facades and declaration boards, raising the flag and behavioral and educational role of parents and teachers have an influential role in the mental image of the children in these age categories. Research findings also indicate that components such as scale changes, the use of cheerful colors, architectural distinctions, the use of textures that fit children's character for materials, such as hearts, stars, or animation characters, graphic and fantasy signs and symbols are suitable stimulants for wayfinding of children into educational spaces. The application and results of this research contribute to architects, urban designers and environmental psychologists using children's psychological moods and their favorite signs which can reduce the level of stress and its consequences among children.

6- CONFLICT OF INTEREST: None.

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