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Recommendations for Designing Child Oriented Play Grounds in Open Spaces of the Residential Complexes (Children 5 to 12 Years Old)

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Abstract: ***Open spaces of residential complexes today due to lack of the necessary factors for the children's play needs , are not considered good places for them to interact with each other. Considering the role and importance of playing in the promotion of children's health, it is necessary to revise the design of residential outdoor courtyard. The purpose of this research is to provide solutions in order to make these spaces suitable for children aged 5 to 12 years old. In this study, after extraction of items related to outdoor playgrounds from the study of the theoretical foundations of research and review of previous stydies conducted in this area, the items were classified under three main variables: the renovation of the space, social participation and quality of the natural environment, each of them included number of dependent variables. Then by using a questionnaire with 14 closed questions (the main body of the questionnaire), which are in the Likert scale of (very little) to (very high), and three open-ended question filled by parents of children 5 to 12 years, and analysis of 50 drawings by children 5 to 12 years old from the expectations of play grounds, the existence of these variables in open space of residental complexes were examined. The population investigated in this study consist of the parents of children living in 600 dastgah residental complex in mashhad . It was choosed because of over 1000 habitants and about 70 precent of it's area was open space and play ground for children. It was recognized that the research tool had a good validity. Also, the reliability value of research was 0.79 using cronbach's alpha. finally by using spss software and with the help of exploratory factor analysis, outdoor play component of the residential complex were classified as: the possibility of collective and cooperative activities, children's sensory characteristics, dynamic interaction with the environment, security and diversity of green space and suggestions for the designing open space containing these components in general for all residential and specifically for residential complexes 600 dastgah in Mashhad was introduced.***

Keywords: Residential complexes, Children's play grounds, Children between 5 to 12 years old, Open spaces

1. Introduction

Observing residential architectural design principles of open spaces with the aim of considering children 5 to 12 years, could make this spaces suitable for children to play. Proper design of living spaces of children who are the creators of the next generation of society is important in pushing the human society towards a healthy society. Home is the origin and destination of human life And in today's homes bed is the only space where the children can play and skip to. Since the world around children is designed for adult, So they are trying to make a special space for their own through playing, and this is why playing is very important in children's development. On the other hand, children are born inherently nature friendly And as they imagine the world around them a kind of play ground, nature and green spaces can be suitable to amuse them for hours. Therefore, finding the open green spaces residential design standards with regard to the views of children through experiences gained through the game environment, is necessary.

2. Literature Survey

2.1 Characteristics of children 5 to 12 years

Select the ages of contacts based on time formal education from the age of 5 years (starting imagination and curiosity) to 12 years (during the lively teenager) have been made. In developmental psychology topics, this age is refered as ((middle childhood)). This study focused on the age group above and the order of the children in the study age group 5 to 12 years. In this age imagination grows and practical work gets noticed. Curiosity, adventure and activities such as these are too strong in the child.[1] Interest in showing speed, strength and skill in the game and the desire to compete the games are some of the characteristics of children this age group[2]. Children in this age are obviously learning from their environment, And clearly show their sense of interests toward the invironment and activities associated with it.

With the development of the child, his ability to go beyond the scope of her game indoors increases and the Places he chooses to play are residential area, playgrounds and neighborhood areas.[3]

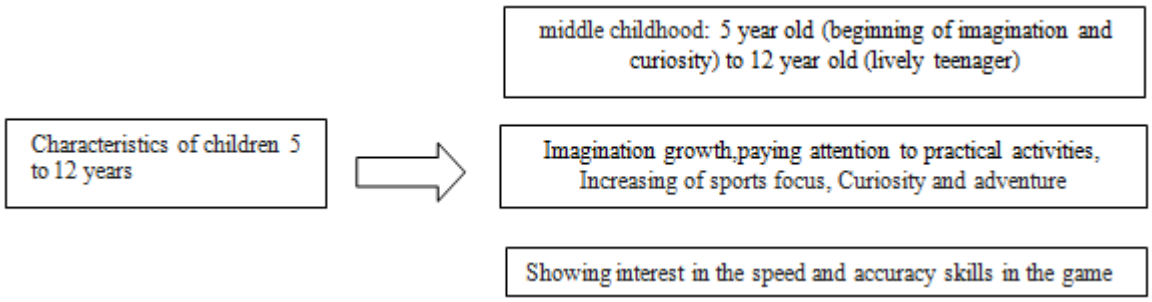

Figure 1: Characteristics of children 5 to 12

2.2 Children's interaction with the environment

Most of psycologists often believe that explore and search in the environment is critical in the formation of character and human cognition. The roots of the environmental perceptions in humans is seen from the childhood, and can be developed human growth Based on the empirical findings of environmental psychology and other courses.[4]

Express basic growth needs, it is emphasized on the role of living environment around children for free and independent mobility, develop physical skills and mental and emotional relations[5].The recent researchers believe that designing the child oriented spaces like open spaces of residental complexes are important due to their direct effects they have on children[6].

2.3 Originality and importance of play in child development

Children use the game as a means to understand the world, a touch of reality, explore the physical properties of objects and make changes in the environment[7].

Children tend to run, play and painting, is something instinctive and it is dependent on the world of the dream. To say the significance of the game, is sufficient to note that the researchers state three advantages of physical growth, intellectual growth and social growth, Which ultimately led to the creation of the organization, training and social cognition[8].

3. Research Body

This is an applied study and it aimes to suggest design principals to make open spaces of residental complexes suitable for children to play in. Factors influencing this were identified through library studies, questionaries and analysis, interviews and interpretation of paintings drawn by children. The following table shows the factors that has been achieved from previous research studies conducted in this area.

Table 1: Architectural design needs and behavioral patterns of children 1 to 12 years

Researcher					*Principales*
Great Britain play commity(2006)[12]	Hamed Kamel Nia(2009)[11]	Hamid Reza Azemati(2013)[10]	Arezo Maani(2012) [9]	Nafise Jamali(2014)	
Criterion					
• Designing due to site potentials • Appropriate location • Using natural elements • Create a wide range of game experiences • The presence of children with disabilities and disability among others • Meet the social needs • Meet the curiosity and adventure • Flexibility • Construction materials, durability and ease of maintenance materials	• Green spaces • Closeness by plant elements • Lighting • The combination of open space and green space	• Natural factors (vegetation) • Shaped space and Ergonomics • Visual stimuli • Flexibility in children's play equipment	• Allowing collective game • Meet the curiosity and adventure • Diversity in physical space and activities • Create excitement in the game space Increased physical activity	•The use of natural elements •Design multi-functional spaces •Diversity and complexity in the physical space and communications	

3.1 The content of the questionnaire

After reviewing the theoretical foundations of research and study of previous research conducted in this area, according to the original design criteria tailored to the needs and behavior patterns of children 5 to 12 years and according to the architectural design patterns for children under three main variables: the revitalization of space, social participation and quality of the natural environment

Which are categorized to some dependent variables and put into question. The dependent variables make up the main body of the questionnaire contain 14 questions. These questions are in the Likert scale of (very little) to (very

high), and then three open-ended question filled by parents of children 5 to 12 years **old.** In these questions respondents were asked to mention if there is another factor affecting children play grounds. The questionnaires were distributed in number of sample size calculated which was 100 people. Answers of questionnaires were loaded as follows and evaluated:

Very high	very	Medium	A little	Very little

Evaluating responses, the answers were scored as followes: 5= very high, 4= high, 3= medium, 2= a little, 1= little

The following three independent variables and their dependent variables are listed separately**:**

- Revitalization of space**:** Create a sense of curiosity and adventure, Variation in space and activities, Create excitement in children and increase their physical activity, The appropriateness of the materials used with childrevs activities
- Social participation**:** The possibility of group games for children, The presence of children with disabilities and disability among others, The possibility of playing children on parents presence, The possibility of collective actions
- Quality of the natural environment**:** The relationship between open space and green space, Lighting space properly, The proportion of green space with children's activities, Closeness between outdoor elements and natural plant**s**

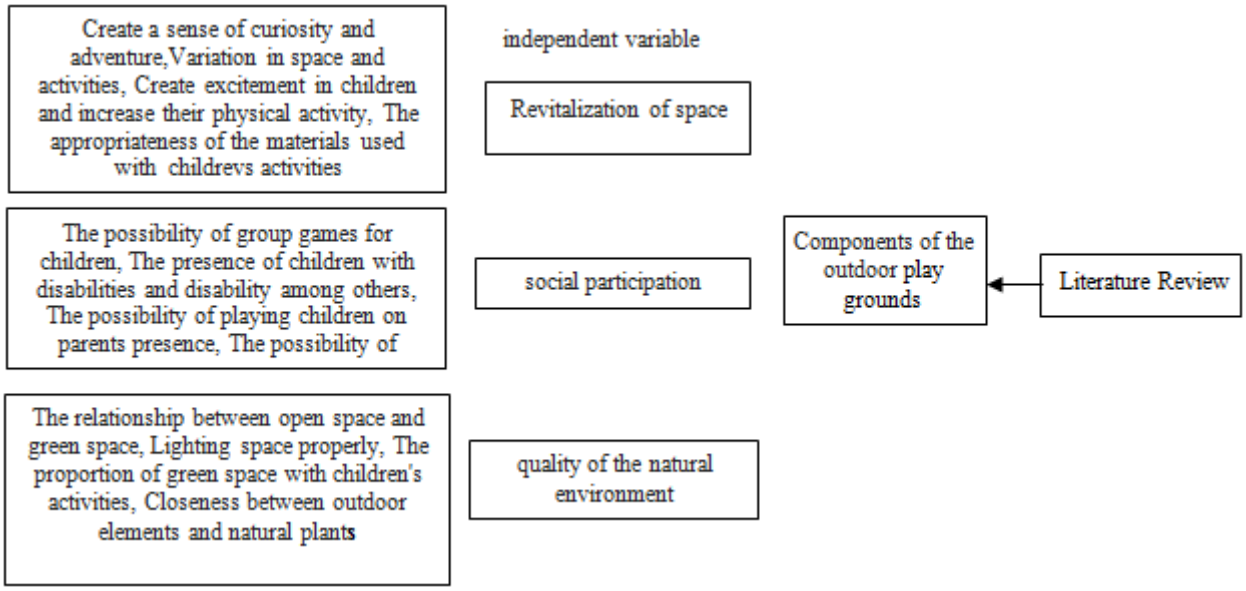

Figure 2: Variables of outdoor play gronds in Residential complexes

4. The population and Sample

The population of this study consists of parents of children living in 600 dastgah residental complex and children themselves.This complex consists of More than 1,000 residents and about 200 households. After initial screening and identification of areas in statistics demographic and semi-structured interviews with residents and residents, as well as experts sample size of 200 households was confirmed. The volume of the sample is appropriate according to Morgan table. The sampling method used in this study is selected regularly and randomly, In this way that from every two householdes at random one is selected.

4.1 The validity and reliability of the questionnaire

The questionnaire is valid that if it be re-used the same results come.
In order to determine the validity of the study factor Cronbach's alpha was used as follows:

$$\alpha = \left(\frac{n}{n-1}\right)\left(\frac{s_t^2 - \sum_{i=1}^{n} si^2}{s_t^2}\right)$$

The above formula shows how to achieve Cronbach's alpha coefficient where st: the standard deviation of the questionnaire,si: standard deviation of question number i, n: the number of test questions[13].

Table 2: Cronbach's alpha coefficient of the questionnaire

Reliability Statistics	
N of Items	Cronbach's Alpha
14	**0.799**

5. Analysis & Results

5.1 Analysis of outdoor play components in residental complexes

As mentioned earlier, after extracting the components of outdoor games Residential, these components were classified in the form of three independent variables : revitalization of space, social participation and quality of the natural environment, each contains number of dependent

variables.In the following, the analysis of answers to open and closed questionare through spss software are given. According to Likert if the number 3 is obtained from the following variable analysis showes discontent, and if 3 or more of respondents obtained indicates satisfaction.

5.1.1 Analysing closed questions

5..1.1.1 Revitalization of space

As previously mentioned, one of the indicators of space for children to play Mentioned during the early studies was the index revitalization of space, discused in the questinare in the form of five items and respondents were asked to fill it according to likret, from very little to very high.

- Revitalization of space:Create a sense of curiosity and adventure,Variation in space and activities, Create excitement in children and increase their physical activity, The appropriateness of the materials used with childrevs activities, space diversity
- Review of the five items proposed for this indicator can be seen in the following table:

Table 3: Study the index:revitalization of space (source: the author)

5. space diversity	4. The appropriateness of the materials used with childrevs activities	3. Create excitement in children and increase their physical activity	**2.** Variation in space and activities	**1.** Create a sense of curiosity and adventure		
90	90	90	90	89	Valid responses	Answers
2.733	2.5222	3.3111	3.2333	2.7528	Interpretation	
1.197	0.95079	1.63739	1.06053	1.12089	Standard deviation	

According to the table above and Likert previously mentioned, Among the items proposed for index rehabilitation of space, number 2 with an average of 3.2333 as (Variation in space and activities) show the highest levels of satisfaction.The next one is number 3 with an average of 3.3111 as (Create excitement in children and increase their physical activity) that shows high satisfaction among parents. The next three variables with values less than three in the whole are unacceptable and shows a lack of satisfaction with respect to their residents.

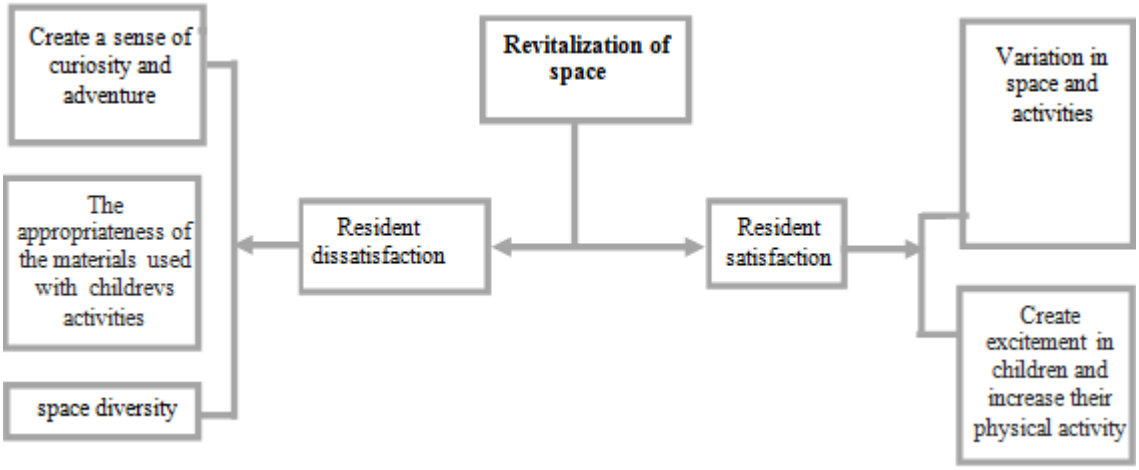

Figure 3: Evaluation of the index: revitalization of the space, (source: the author)

Table 4: Total overwiev of index revitalization of space

90	**Valid responses**	Answers
1.8667	Interpretation	

Total overview of the Index revitalization of the space and its overall analysis in spss software shows figure 1.8667, that according to Likert scale is much lower than 3 and highlights the dissatisfaction of residents and should be considered in the redesigning of space.

5.1.2 Social Participation

One of the other independent factors, social participation, has been devided to four dependent factorrs: The possibility of group games for children, The presence of children with disabilities and disability among others, The possibility of playing children on parents presence, The possibility of collective actions.In the questionare the responders were asked to answere according to Likret.

The resultes are given as below:

Table 5: Study the index:Social participation (source: the author)

4. The possibility of collective actions	3. The possibility of playing children on parents presence	2. The presence of children with disabilities and disability among others	1. The possibility of group games for children		
90	90	90	90	Valid responses	Answers
2.9889	3.1	1.9556	2.8333	Interpretation	
1.21317	1.02825	1.08007	1.18284	Standard deviation	

According to the table above and Likert previously mentioned, Among the items proposed for index social participation, number 3 with an average of 3.1 as (The possibility of playing children on parents presence) show the highest levels of satisfaction.The next three indexes with the average below3 show high level of dissatisfaction.

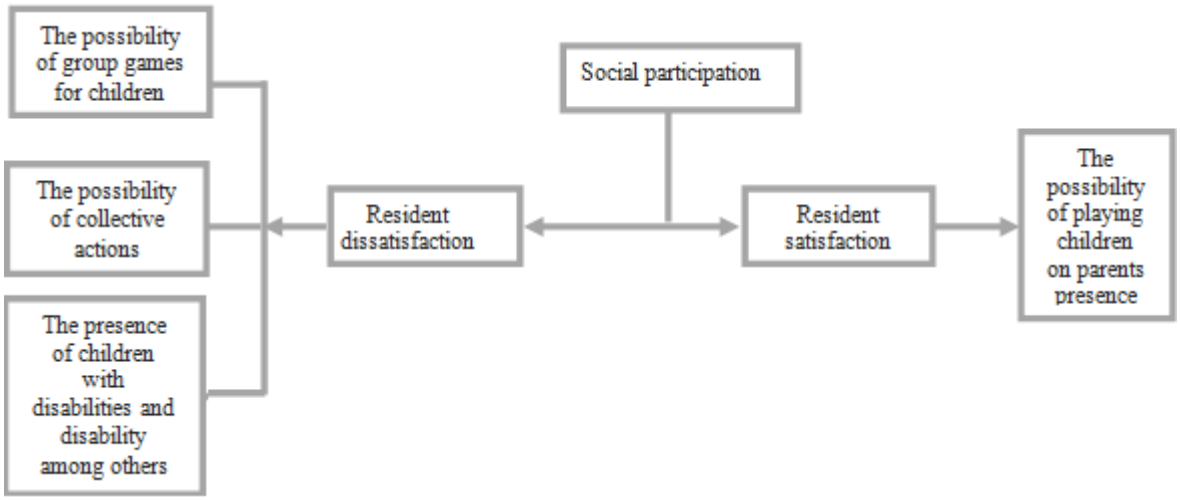

Figure 4: Evaluation of the index: Social participation, (source: the author)

Table 6: Total overwiev of index Social participation

Social participation		
90	Valid responses	Answers
1.6556	Interpretation	
.80951	Standard deviation	

Total overview of the Index Social participation and its overall analysis in spss software shows figure 1.6556, that according to Likert scale is much lower than 3 and highlights the dissatisfaction of residents and should be considered in the redesigning of space.

5.1.3 Quality of the natural environment

The last independent index in close questins called quality of the natural environment consist of five independent factors: The relationship between open space and green space, Lighting space properly, Using natural elements in open space, The proportion of green space with children's activities, Closeness between outdoor elements and natural plants.

The results of analysing factors in spss software are shown in the following table:

Table 7: Study the index: Quality of the natural environment (source: the author)

5. Closeness between outdoor elements and natural plants	4. The proportion of green space with children's activities	3.Using natural elements in open space	2. Lighting space properly	1. The relationship between open space and green space		
90	90	90	90	90	Valid responses	Answers
3.3556	2.7444	2.7444	2.3222	3.0778	Interpretation	
1.16418	1.07642	1.11739	1.16915	1.17299	Standard deviation	

According to the table above and Likert previously mentioned, Among the items proposed for index quality of the natural environment , number 5 with an average of 3.3556 as (Closeness between outdoor elements and natural plants) show the highest levels of satisfaction.The next one is number 1 with an average of 3.0778as (The relationship between open space and green space) that shows high satisfaction among parents. The next three variables with values less than three in the whole are unacceptable and shows a lack of satisfaction with respect to their residents.

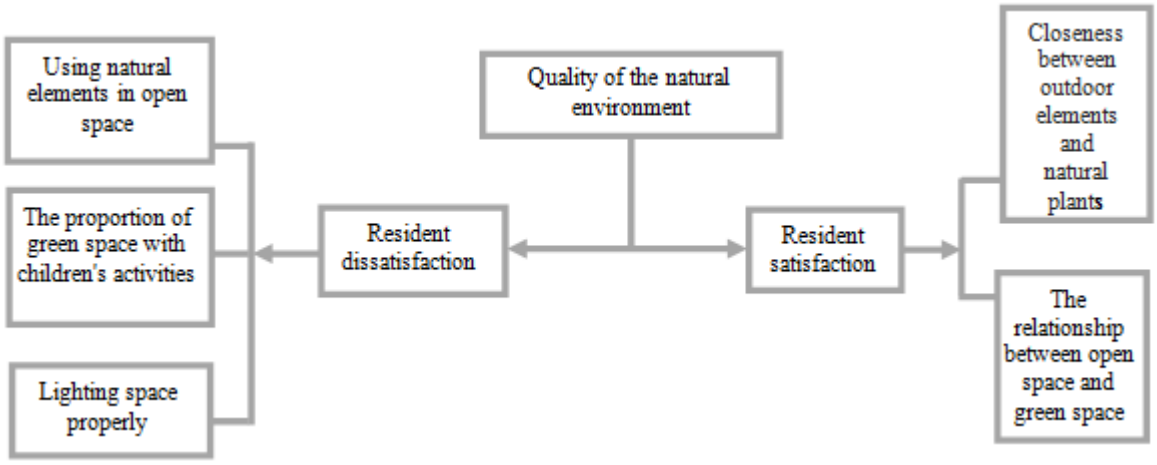

Figure 5: Evaluation of the index: Quality of the natural environment, (source: the author)

Table 8: Total overwiev of index Quality of the natural environment

Standard deviation	Interpretation	Valid responses	
0.85247	1.7111	90	Quality of the natural environment

Total overview of the Index Quality of the natural environment and its overall analysis in spss software shows figure 1.711, that according to Likert scale is much lower than 3 and highlights the dissatisfaction of residents and should be considered in the redesigning of space.

Total overview of all Index and its overall analysis in spss software shows figures lee than 3, that according to Likert scale show dissatisfaction of residents and should be considered in the redesigning of space.

5.2 Analysing open questions

In the end the question was raised a number of open questions to enable residents to suggest how increase outdoor play in open spaces df residential complexes. Items discussed the three questions are as follows:

How to increasethe presence of children in open spaces, better use of green space and increase the possibility of collective presence in space

5.2.1 Check the first question

The final result of analysis of the firrst questions with spss software are as followes:

Table10: Check the first open question, (source: the author)

Percent	Abundance		
1.1	1	The use of experts	Valid responses
12.2	11	Diversity of space	
37.8	34	diversity and quality of children's play space	
6.7	6	Lighting the space	
11.1	10	cultural factors	
4.4	4	Security of the Space	
73.3	66	Total valid responses	
22.2	20	Not answered	Unvalih responses
4.4	4	Unrelated responses	
26.7	24	Total invalid responses	
100	90	Total	

Table 9: Total overwiev of all indexes

Standard deviation	Interpretation	Valid responses	
0.86375	1.8667	90	Revitalization of space
0.80951	1.6556	90	Social participation
0.87245	1.7111	90	Quality of the natural environment

5.2.2 Check the second question

The following table shows results of the second question .

Table 11: Check the second open question, (source: the author)

Percent	Abundance		
7.8	7	Diversity of green space	Valid responses
16.7	15	Enough light	
7.8	7	Cultural factors	
6.7	6	Security of the space	
8.9	8	Privacy of Children's play area	
3.3	3	public services	
12.2	11	natural factors	
34.4	31	Not answered	
2.2	2	Unrelated responses	
100	90	Total answeres	

5.2.3 Check the third question

The results of the analysis of the third question are as follows:

Table 12: Check the third open question, (source: the author)

Percent	Abundance		
6.7	6	Diversity of space	Valid responses
5.6	5	Human Factors	
1.1	1	Clean space	
15.6	14	public services	
11.1	10	Furniture of the space	
22.2	20	Cultural factors	
32.2	29	Not answered	
5.6	5	Unrelated responses	
100	90	Total answeres	

5.3 Analysis of children's drawings from space expected

- One of the ways to achieve the interests of children in the open space was to ask them to draw the best designed play ground that they imagine. Older children pointed more details of this space, While childrens aged less proposed overview of space. The study of drawn pictures by children from their expected play ground, It seems that all of them refer to the following elements in their playing field:
- Green space with a variety of shapes and good dispersion, water, various play equipments, attendance of parents at their side, places to sit inside playground, playing group games, a variety of consumable materials.

5.4 Factor Analysis

One of the statistical methods to analyze the information contained in the collection, is analysis of the data or Factor Analysis. The procedure, is used for determining the most influential variables when large number of variables studied and the relationship between them is unknown. In fact, the main purpose of using factor analysis, data reduction and determine the most important variables in the formation of phenomenan. Given the number and types of variables in this study, exploratory factor analysis that can be done in software spss used. Components obtained from the questionnaire and the analysis of children's drawings, were evaluated by factor analysis and software spss and the following results were obtained:

Table13: Factors affecting the play grounds of open space of residential buildings (Source: author)

Component					
Factor1	Factor1	Factor1	Factor1	Factor1	
0.055	0.284	-0.278	0.789	0.405	Curiosity and adventure
0.004	0.038	.0.224	0.745	.0.110	Ability to perform various activities
0.212	0.030	0.221	.0.958	0.21	Create excitement in children
0.217	0.538	-0.127	.0.085	.0.100	Material Consumption
0.518	0.132	0.442	0.103	0.441	Diversity of space
0.164	-0.039	0.334	0.261	0.808	The possibility of group games
-0.050	0.456	0.037	-0.126	0.702	The possibility of the presence of children with disabilities and disability
0.053	-0.156	0.592	0.182	0.274	The possibility of playing children with parents
0.077	-0.015	0.170	0.255	0.941	Possible collaborative activities
0.105	0.220	0.972	0.169	0.88	Relationship between open and green space
-0.111	1.011	0.283	0.116	0.03	Proper lighting space
0.625	0.63	0.582	-0.128	0.137	The use of natural elements in the open space
0.404	0.470	0.027	0.094	0.509	The proportion of green space with children's activities
1.005	0.072	0.040	0.226	0.021	Closeness by herbal and natural elements

- **Factor1:** Since this factor has the most number on the indexes such as: the possibility of group games, the possibility of the presence of children with disabilities, the possibility of collaborative activities, the proportion of green space with Children's activities, these factors are named as the possibility of collaborative activities and partnerships.
- **Factor2**: Since this factor has the most number on the indexes such as: Curiosity and adventure, various activities, excitement in children the factor is named as attention to children's sensory .
- **Factor3**: Most of the number of this index is on the factors such as: the possibility of playing in front of parents and relationship between children and open space, thereby its named as Dynamic interaction.
- **Factor4**: The most frequently used indicators are building materials and proper lighting of the space so it is named as security.
- **Factor5**: Since this factor has most frequently on indicators such as: the space diversity, the use of natural elements in the open space, closeness between elements and natural plant, this item is named as diversity of green space.

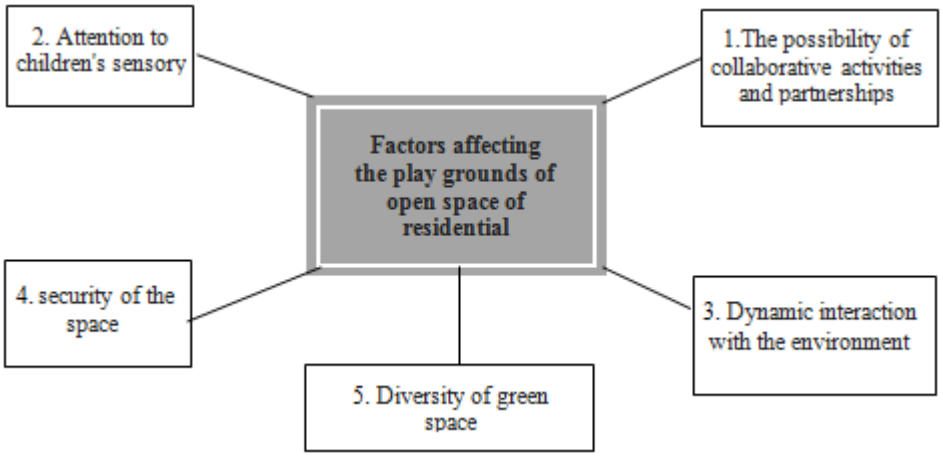

Figure 6: Factors affecting the play grounds of open space of residential complexes

After each of the open questions were analyzed independently, the results of the review of factors set out by emphasis on the factors with the highest frequency is as below:

1) The possibility of collaborative activities and partnerships:

- Creating openness on track for placement of gaming equipment
- Placing ramp with low slope in the direction of the difference height
- Compliance with security and privacy of persons with disabilities and design special spaces with bicycle traffic restrictions in these spaces
- using flexible furniture in space
- Involving children in the process of designing and building public play spaces, using techniques such as: meeting parents and children friendly in outdoor excursions and painting techniques

2) Attention to children's sensory:

- creating variety in the game space using different elements in a variety of colors, shapes, textures and so on
- embedding with various forms of green routes to strengthen children's curiosity
- Creating some ambiguity and complexity of the full resolution, so that at the beginning of the play ground, all the space and what is in not be visible.
- Creating physical attractiveness in commuting paths to encourage children to walk in the paths

3) Dynamic interaction with the environment

- Locating leisure, educational, exhibition for parents around the grounds with privacy
- Avoid creating less traffic and quiet outdoor children's play corner
- Creating proper access to green open space and vice versa
- Maintaining open views and extensive open space than the existing green space

4) Security of the space

- Input Space: using visible and detectable bright lights, using appropriate angle
- Access routes: proper lighting, adjusting the spacing relative to each other and relative to the width of the street lights
- Space green lighting of the mass of plants
- Playground: providing sufficient brightness for Games, equal and adequate lighting in all areas

5) Diversity of green space:

- Combining different elements in space: water, vegetation, etc
- limiting the space defined by walls and natural elements
- Using plants appropriate in all seasons

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