Navigation in Determining the Physical Factors Affecting Creativity of Children's in Urban Parks

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ABSTRACT: Despite the availability of extensive facilities for children, the effect of environment on creativity of children is often ignored. It is a fact that children can attend the playgrounds in city parks, independently, from age 6, therefore they become exposed to influence of the environment during this age period. It is necessary to design playgrounds for children to improve their creativity. The objective here is to assess the effects of physical components of the playgrounds in city parks on creativity of children of ages 6 to 12. A descriptive- analytic method is adopted in this study. This method is adopted to achieve the theoretical perspectives and correlations between the variables and indices, through analysis. At this stage, the data are collected from a selected statistical population through field research and closed response researcher designed questionnaire and the effective variables are determined by factor analysis and correlation. By applying path analysis method using of Smart PLS1 software program based on the relations between the variables, the study model is provided. The results indicate that there exists a significant correlation between the environmental factors and creativity and regarding the rate of effectiveness of the physical factors on creativity, the variety factor is more effective, followed by physical liveliness and flexibility factors, respectively.

Keywords: *Flexibility, Variety, Liveliness, Creativity, Path Analysis*

INTRODUCTION

Due to the contemporary problems like urbanization, lifestyle and building, parks and gardens are considered as inseparable parts of urban life. After school, children spend a major part of their time in social interactions. Due to lack of environmental stimuli, sensory-motor and mental experiences will exert detrimental effects on psychological and social growth of children. Promoting and enriching the quality of the city parks can effect, social interactions and creativity among children. Although among the various effective factors in development of children's creativity, the educational methods, emotional-cognitive aspects of children and also the training matters are analyzed, is the qualitative effects of the city spaces effective in promotion of children's creativity has not been addressed properly. In recent years, extensive research has been and is being conducted in this field. Beginning from the mid-twentieth century, the researcher in the field of urbanization have analyzed the form of city and the topics there of in three environment and behavior, place and its image, and structure and process approaches (Zaker Haghighi et al., 2011). Although, many physical factors like light, landscape, and even sound and visual pollutions are effective in proportion increase in creativity (Kristensen, 2004), their effects on human creativity has been over looked in urban spaces. Psychologists believe that many problems about full development of children like promotion of creativity are highly adaptable by developing public open spaces within the heart of the city and providing spaces for daily activities which provide physical and mental conditions of children (Christensen & O'Brien, 2003). Based on the theories proposed on developmental psychology, the age of 6 to 12 years is the stage named commune and construction (Ahadi & Banijamali, 2010) and Piaget asserts that it is the beginning of objective function (Piaget & Inhelder, 1969). Systematic thinking is realized in this stage of growth and children are able to learn fast and think rational. This period is the time of sowing the seeds and developing imagination in the mind of children. Therefore, due to the fact that children can go to the playgrounds of the city parks from age 6, almost independently and based on the studies of the developmental psychology that at this age group, children receive the highest effects from the environmental stimuli, it is necessary to make attempts to increase creativity of the children of this ages group by environmental physical features like variety, liveliness, and flexibility.

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Due to the significance of the topic, the purpose of this study is to assess the factor of physical variety, physical flexibility and liveliness in the playgrounds affecting children's creativity. On this basis, two hypotheses are proposed: the features of the playgrounds including physical variety, physical flexibility, and liveliness led by presence of natural factors in city parks and are effective on increasing creativity of children and second, there exist difference, among the rate of effect of physical indices of the environment in dimensions of children's creativity in city parks. The structure of article has be shown like Fig. 1.
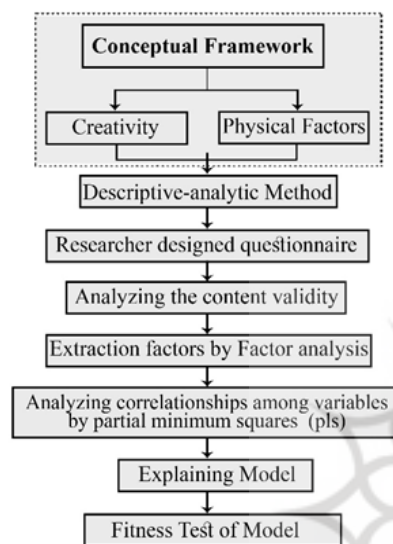

Fig. 1: The structure of article.

Conceptual Framework of the Study
Creativity

According to webster (2006), creativity derives from the term 'create' meaning 'to bring into existence' or 'to bring about', and 'creation' which means 'the act of bringing into existence' or 'the act of making' and also 'creative' which means 'having the power and ability to create'. Creativity is a concept of bringing forward new ideas and shunning repetition of unproductive ideas. Though creativity cannot be learned but can be encouraged and motivated (B Eigbeonan, 2015). Creativity has been and is considered to be the outcome of a complex interaction among different components. Since the concept of creativity is abstract, there are various theories in this regards and it is looked upon from different perspectives but freshness and novelty are the common grounds of all these definitions, that is a new work not existed before, by freshness we mean being new for the person (Lubart, 2003; Runco, 2014). According to applied the used concepts it is realized that: first, the nature of creativity depends on human thinking and its outcomes, said otherwise, creativity is cross sectional point in the confluence of perceptual, emotional, environmental and motivational variables; and, second, it consist of finding new and effective methods.

Without the three basic features of being mental, innovative and affective, the title of creativity cannot be attributed to a mental process and activity or operation.

In factor analysis theory, according to by Guildford (1996) creativity includes eight fundamental dimensions of originality, flexibility, fluency, expansion or elaboration, combination, analysis, organizing and complexity. To him, the first three cases are directly effective in emergence of effective creativity. Effected by this theoretical framework, Torrance (1988) confirmed only four of the above eight dimensions: Originality, flexibility, elaboration, and fluency.

Originality: the ability to create new, unique, uncommon and intelligent ideas to solve a problem which is in any way different with the regular and current ideas. At this state, the creative person has the ability to introduce new and innovative ideas (Guilford, 1966; Torrance, 1988). In this study, the innovation dimension is considered as the innovative and unique park entertainments subjects to the existing urban conditions.

Flexibility of thought: According to Torrance (1988), flexibility means being ability to introduce different and various ideas in the form of images and proposing new solutions therefore. However, Guildford (1966) believes that creativity means the ability to create and introduce different ideas if the problem is changed; in this case, the creative person has the required power and ability to change the direction of his thought and present it from different angle. In this study, it could be considered as the child's ability in coordinating himself with physical conditions and introducing various and uncommon thoughts when in parks enjoying their time.

Elaboration: In this state, the creative person has the ability to complete an idea, add more details and complete its related visual ideas; that is the ability of a person to deal with details (Guilford, 1966; Torrance, 1988), in specific, the child's ability to complete and deal with the game details.

Fluency (fluidity): Fluency is the person's ability to introduce many ideas, responses, and solutions in form of images or assumptions in a particular domain. At this state, the creative person's mind produces ideas in a specific thinking domain which includes a number of possible responses and opinions (Guilford, 1966; Torrance, 1988). Due to the fact that in the three previous dimensions the number of responses and games are taken into account, the three dimensions of originality, flexibility of thought and expansion are considered as creativity indices.

Physical Factors

As one of the most important productions of urban designing, the physic of public open spaces needs to meet its users' requirements and expectations. In order to determine the physical factors affecting creativity, after studying the related texts, the effective factors are identified based on viewpoints of Amabile et al. (1994) and Amabile and Pillemer (2012), Altman et al. (1980), Thórisson (2004), Brodersen (2005), Hemlin et al. (2008), Plambech & Bosch (2015) , Fig. 2. in bar chart which is derived based on frequency of opinions on every

physical features.

According to the viewpoints of the scholars about every physical feature of indoor and outdoor the spaces, it can be said that the variety, exploration, and complexity with score of %21.34 are ranked the highest among other components. The natural environment and liveliness with score of %18.44 are ranked the second. The participation or sociability, which is not a direct component of the physical factors, with score of %17.47 is ranked the third and the physical and operational flexibility with score of %10.67 are ranked fourth. The fifth to twelfth factors consist of facilities, forms and dimensions of space, relaxing and perceptible, safety and security, being scenic, furniture, color, and access and permeability in the order of priority. Therefore, it could be claimed that from scholars' viewpoint, the three important physical features effective on creativity are the variety, liveliness, and flexibility.

Physical Variety (Diversity)

The variety in space experience implies to the environmental features of the places which have various forms, application and meanings. The purpose of variety and diversity is to increase the rate of choices (Bently, 2004). In the book "Life and Death of American Cities", Jane Jacobs has proposed five criteria for a desirable space among which one is variety. To him, variety provides the appropriate ground for development of entrepreneurship, creativity and innovation (Sharepour, 2010).

Fainstein & DeFilippis (2015) defines variety in urbanization through a mosaic by use of mixed buildings, various types of houses, mixed applications, and density mixing. Tibbalds (1990) believes that urban variety means social, physical-visual and operational variation, and to Talen (2012), the effect of interaction of historical, economic, social, policy-driven and procedural factors as well as physical factors. For this purpose and for providing attractive, various and live spaces, two methods could be adopted: first, through human presence accompanied with human activities and second, by applying

artificial and natural elements in the environment. The focus of this study is on the physical variety in the playgrounds.

Flexibility (Multi-functional Space)

Urban flexibility refers to the ability of the city system and all social, environmental and technological networks which could desirably respond to the requirements in critical and specific conditions at a given time and be able to update and coordinate itself under different conditions in a rapid manner (Meerow et al, 2016). In a smaller scale, flexibility means the ability and power of the area in accepting functions and justifying various activities. To put it simply, it refers to the places which are responsive to different functions in a given or different times due to the availability of facilities, dimensions of the space, presence of different spatial levels etc. (Bently, 2004). Accordingly, Fallah et al. (2014) state that flexibility in a small scale refers to the dimensions and different components of the space, functions within the city, the ability and availability of these factors inclusive for all groups and different needs. Therefore, three definitions could be given for flexibility: 1) Versatility (seasonal and daily displacement), 2) Changeability (differentiation (separation and integration) and 3) Variability (multi-functional space) (Eyniefar, 2004). In this study, flexibility is defined by the variability and changeability to serve the purpose.

Physical Liveliness (Natural Factors)

According to Okulicz (2013), a live city is one belonging to all of its social groups and providing general livability, quality, and desirability for the same. The key issues concerning vitality in a place are the presence of people at different times and the compatibility in diverse activities (Karami et al., 2015). Therefore, to achieve liveliness in the urban environment, there is a need to provide places and conditions for creating joyous experiences (Crowhurst & Lenard, 1999).

Landry (2000) has divided liveliness into four groups of economic, social, environmental, and cultural and he considers
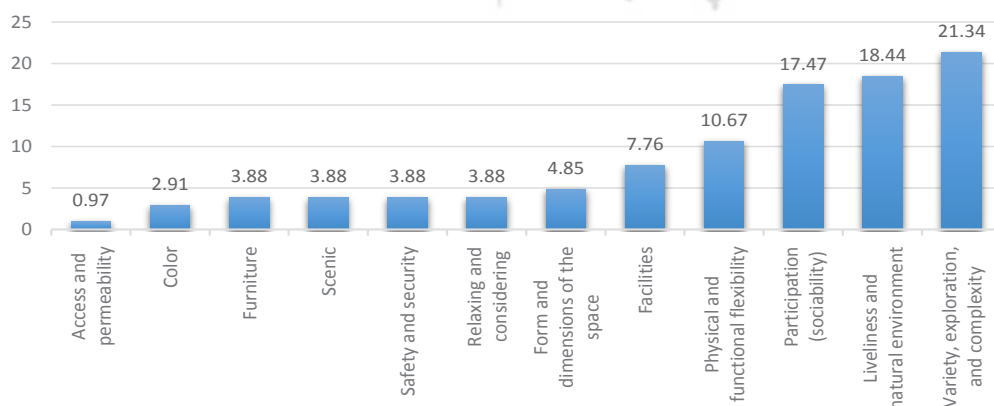

Fig. 2: The effective physical factors on creativity based on theorists' viewpoints. (Fallah et al.,2014)

two dimensions for environmental livability: the first is ecological sustainability which is related to some variables like air and sound pollutions, disposal of waste products and sewage, traffic jam, and green spaces; the second dimension is designing which includes the variables like legibility, sense of place, architectural distinction, connection of different parts of the city to one another, brightness quality, and the fact that to what extent is the city environment friendly, secure and psychologically intimate to its citizens. Pakzad (2006) has divided liveliness into two groups of macro, physical (including furniture and attached elements to the ground and body such as plants, natural elements and canopies) and function. For Paumier (2004), liveliness indices consist of users, legibility, variety and simplicity, spatial appropriateness, pause places, physical comfort and mental peace, and encouragement of social-cultural activities. Lynch (2003) in his classification, has considered the biological and ecological criteria and has dealt with liveliness in this context. Knoflacher (2003) has particularly emphasized on the effect of the fountains on liveliness in urban environments. Accordingly, by developing natural elements: gardens, flowers and plants, the dry and rough views can be turned into pleasant and joyous places with more friendly feelings. Due to the mentioned topics in this study, the main focus is on the liveliness provided by presence of natural elements in the environment and the effects thereof.

By analyzing the proposed theories about features of physical variety, liveliness, and flexibility in architectural and urbanization contexts, the required variables in effecting factors on designing the playgrounds to improve creativity are tabulated in Table 1.

MATERIALS AND METHODS

A descriptive-analytic method is adopted in this study. This method is adopted to achieve the theoretical perspectives and correlations between the variables and indices, through analysis.

The required data is collected through field research and a researcher designed questionnaire.

This questionnaire consist of 38 questions base on componential indexes and content objective table generating closed response questions. These data is classified by SPSS software program and the factors are analyzed and correlated which reveal the effective variables. Based on the correlations among these variables, a hypothetical model is proposed and verified through path analysis method and Smart PLS software program.

The population of this study consists of all urban planners, architectures, psychologists, and specialists in educational sciences. In order to increase the validity of the results, the selected population professionalism should include the concept of child psychology and its creativity.

The questionnaire is handed to 154 candidates of who satisfied the above category, while only 70 of them responded.

RESULTS AND DISCUSSION

In order to analyze the content validity of the questionnaire a content-objective table is prepared based on Table1. Face validity is carried out by professional experts in the fields of urban planning, architecture, psychology, and education. For validity of the structure, factor analysis method is adopted. Two calculation methods of discrimination coefficient and loop are applied to analyze the questions. The KMO coefficient for this analysis is 0.568, indicating an average and moderate factor analysis (Field, 2013). The obtained Bartlett's test results of sphericity is 611.928 with a statistical significance of $P<0.001$. The results of factor analysis indicate that by receiving the experienced specialists' viewpoints on the mentioned fields and the contribution of the introduced physical features the environmental function on children's creativity increase can be element' confirm moderate prediction power of the model and

Table 1: The dependent and independent variables and the distinct indices of each.

Dependent variables		Independent variables	
Factor	**Index**	**Physical factor**	**Index**
Creativity	Originality	Physical variety	Various materials
			Various volumes and forms
			Spatial contrast
			Marking index elements
	Flexibility of thought	Physical flexibility	Space dimensions
			Changeability of facilities and materials
			Horizontal and vertical various levels
			Various sitting places
	Expansion	Liveliness created by presence) (of natural factors	Natural beautiful scenes
			Physical comfort
			Mental peace
			(Cozy atmosphere (sense of belonging

Table 2: The sum of the explained variance after rotation.

| | Component | Rotation Sums of Squared Loadings | |
		% Cumulative	٪ of Variance
1	Flexibility of thought	13.049	13.049
2	Various materials	24.768	11.719
3	Marking index elements	35.579	10.811
4	Liveliness	46.361	10.782
5	Physical flexibility	56.496	10.135
6	Elaboration	64.719	8.223
7	Originality	72.570	7.851
8	Variety of visual elements	80.359	7.789

measured in an appropriate manner. The obtained results from validity analysis of the questionnaire with Alpha coefficient of 0.903 indicate that the researcher designed questionnaire meets the necessary research validity.

Effective Variables

After analyzing special values of the variables in SPSS software program, 8 factors are extracted by the software, since the factor load was bigger than 1. For final extraction of the factors, Scree Slope is applied. Since there is a steady and almost fixed slope after the 8th factor, the first 8 factors which have factor load of higher than 1 are extracted from the graph. After determining the appropriate factors for rotation through Varimax method, the factor loads of the 8 extracted factors are considered as the main factors. Based on Table 2, and they are distributed more evenly in the order, ranked in their efficiency: the first with 12.629%, the second with 12.303%, the third with 10.471%, the fourth with 10.153%, the fifth with 9.721%, the sixth with 8.622 %, the seventh with 7.690% and the eighth with 7.660%.

After extracting the 8 main factors, the correlation of factors with each question is determined. Next, by considering the common contents of the correlated questions, the corresponding term with the extracted factor is interpreted based on the variables of urban planning and psychology in

accordance with Table 3. To the experts the first factor is the Flexibility of thought, the second is Variety of materials, the third is Landmark element, the fourth is Liveliness (presence of natural elements), the fifth is Physical flexibility, the sixth is Elaboration, the seventh is Originality and finally the eighth is Variety in visual details.

Explaining the Research Model

The tables of frequency distribution and reliability coefficient of the extracted variables confirm the agreement of the respondents with the extracted factors from the questionnaire. Here it can be assumed that there exists a significant correlation among the factors of creativity like: 'originality, 'flexibility of thought' and 'elaboration' and the physical factors like: 'variety of materials, 'landmark element', 'liveliness', 'physical flexibility', and 'variety in visual details' in the playgrounds provided for children in the city parks. At this stage, through the partial minimum squares approach and Smart PLS software program, a model from the correlations among the extracted factors can be proposed, Tables 4 and 5. In every case t>1.96, indicating that the direct and indirect correlations are accepted at %95 confidence level. The significant figures at %99 and %99.9 confidence levels are 2.58 and 3.27, respectively (Davari & Rezazazeh, 2015).

Table 3: The extracted factors, reliability coefficient of the factors based on the correlated questions and the frequency distribution based on the specialists' viewpoints in urban planning and psychology.

| | Component | Reliability coefficient | frequency (in percent) | | |
			low	middle	high
1	Flexibility of thought	0.732	2.9	11.5	85.76
2	Various materials	0.793	0	2.9	97.1
3	Marking index elements	0.825	5.7	40	54.3
4	Liveliness	0.824	0	8.7	91.3
5	Physical flexibility	0.811	2.9	22.8	74.3
6	Elaboration	0.705	0	8.6	91.4
7	Originality	0.714	0	5.7	94.3
8	Variety of visual elements	0.738	0	11.4	85.6

Table 4: Standard direct effects (regression weights).

Significant level	T Statistics	Standard Error	path coefficient	Hypothesis	
				(Significant Correlation between the Variables)	
P= 0.001	T= 3.269	0.171	0.563	Originality	Physical flexibility
P= 0.000	T= 16.492	0.047	0.777	Elaboration	of visual elements Variety
P= 0.045	T= 2.016	0.194	0.391	Liveliness	of visual elements Variety
P= 0.011	T= 2.581	0.128	0.329	Flexibility of thought	of materials Variety
P= 0.000	T= 3.964	0.122	0.485	Physical flexibility	of materials Variety
P= 0.000	T= 5.122	0.128	0.658	of visual element Variety	of materials Variety
P= 0.038	T= 2.083	0.166	0.346	Landmark elements	of materials Variety
P= 0.015	T= 2.454	0.172	0.423	Originality	Liveliness
P= 0.000	T= 4.342	0.159	0.688	Flexibility of thought	Liveliness
P= 0.017	T= 2.411	0.192	0.462	Liveliness	Landmark elements

Table 5: Standard indirect effects

Significant level	T Statistics	Standard Error	path coefficient	Hypothesis	Conclusion
				(significant correlation between the Variables)	
P= 0.144	T= 1.468	0.113	0.165	Variety of visual elements affects Originality (Through Liveliness factor)	**unacceptable**
P= 0.088	T= 1.716	0.157	0.269	Variety of visual elements affects Flexibility of thought (Through Liveliness factor)	**unacceptable**
P= 0.000	T= 3.904	0.115	0.449	Variety of materials affects Originality (Through Physical flexibility, Marking index elements, Liveliness, Variety of visual elements factor)	**acceptable**
P= 0.005	T= 2.849	0.101	0.287	Variety of materials affects Flexibility of thought (Through Marking index elements, Liveliness, Variety of visual elements factor)	**acceptable**
P= 0.000	T= 4.913	0.104	0.511	Variety of materials affects Elaboration (Through Variety of visual elements factor)	**acceptable**
P= 0.002	T= 1.468	0.134	0.417	Variety of materials affects Liveliness (Through Variety of visual elements, Marking index elements factor)	**acceptable**
P= 0.096	T= 1.674	0.117	0.195	Marking index elements affects Originality (Through Liveliness factor)	**unacceptable**
P= 0.017	T= 2.454	0.132	0.318	Marking index elements affects Flexibility of thought (Through Liveliness factor)	**acceptable**

The independent factor of "variety of materials" and the four intermediatory factors of "landmark element", "liveliness", "physical flexibility" and 'variety in visual details' in addition to the three dependent factors of "originality", "flexibility of thought" and "elaboration" are illustrated in Fig. 3.

Fitness Test of this Proposed Model
For assessing the models of structural equations, the following three sections of this model are analyzed: 1) fitness of the measuring model (external model), 2) fitness of the structural section, and 3) fitness of the general section of the model.

Fitness of the Measuring Model
Reliabilities of the index, convergent and divergent validities are evaluated in fitting the inner section of the model. To analyze the reliability of the index, the factor load coefficients of each question are studied. It is obvious that here 0.4 indicates the variance between the structure and its indices (questions) which is more than its measurement error variance and the reliability of the model is acceptable (Davari & Rezazazeh,
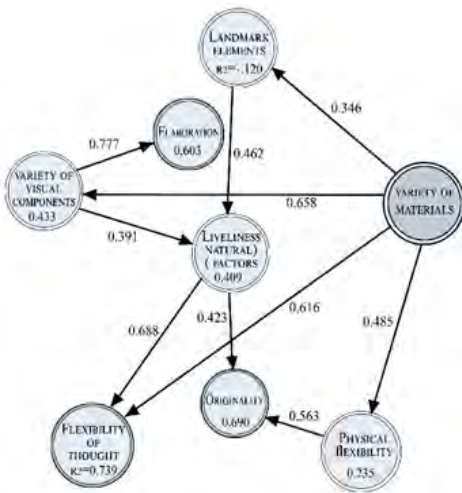
Fig. 3: The proposed model for correlation of variables.

2015); consequently, the reliability of measurement in this model is acceptable at this stage.

In order to analyze the Cronbach's Alpha, the composite reliability (CR[2]) and convergence validity (AVE[3]) their value are obtained. According to the appropriate value of Cronbach's Alpha, the composite reliability 0.7 and 0.5 AVE for each criterion is analyzed and because of their appropriate values, the composite reliability and validity of the model were confirmed.

The Fornell and Larcker method is adopted in analyzing the divergent validity. Since the divergent validity is acceptable at the level when AVE value for each structure is bigger than the common variance between that structure and other structures (square of the correlation coefficient between the structures) in the model (Davari & Rezazazeh, 2015), the divergent validity in this structural model is appropriate indicating the good fitness of the measuring model.

Fitness of the Structural Section

In order to study the fitness of the structural section, the significant coefficient of t[4], R Square criterion, and Q^2 [5] criterion are applied. In analyzing coefficient t, to confirm the study hypotheses, the correlations between the variables with values less than 1.96 are omitted and finally, the correlations mentioned in Table 6 remained constant. The significant values at confidence levels of %95, %99, and %99.9 are 1.96, 2.58, and 3.27, respectively (Davari & Rezazazeh, 2015).

The R^2 value indicates the effect which an exogenous variable inflicts on an endogenous variables were the value of 0.19, 0.33, and 0.67 represent weak, moderate and strong fitness and the value of zero indicates independent or exogenous variable. The Q^2 criterion determines the prediction power of the model and values of 0.02, 0.15, and 0.35 indicating weak, moderate and strong prediction power (Davari & Rezazazeh, 2015). According values of R^2 and Q^2 in Table 7, the endogenous variables of "liveliness", "physical flexibility" and "landmark element" confirm moderate prediction power of the model and the exogenous variables of "flexibility of thought", "elaboration", "variety of visual details" and

"originality" confirm strong prediction capability of the model and appropriate fitness of the structural model. It should be mentioned that due to low R^2 coefficient for the variable of 'landmark element' which means weak effect of the variable of variety of materials, it is obvious that the prediction capability of this factor, according to the value of Q^2, be calculated in moderation.

Fitness of the General Section of the Model

By applying the goodness of fit (GOF6) criteria the fitness of the previous two sections are controlled in this section. The three values of 0.01, 0.25, and 0.36 are considered as weak, moderate and strong for GOF by Wetzels et al (2009). Based on the run calculations, the value of GOF for this proposed model is 0.521, indicating a generally strong and appropriate fitness of the model.

Table 6: R^2 coefficients, types of variables, Q^2 coefficients, and prediction power of final relations among variables of the proposed modelThe significance coefficients of t in the final correlations among the variables in the obtained model.

Correlation among the Variables	T-values (T>1.96)
Physical flexibility on the Originality	3.472
Elaboration Variety of visual details on the	16.710
Variety of visual details on the Liveliness	2.120
Flexibility of of materials on the Variety thought	2.348
of materials on the Physical flex- Variety ibility	3.668
Variety of vi- of materials on the Variety sual elements	6.243
of materials on the Landmark ele- Variety ments	2.136
Originality Liveliness on the	2.415
on the Flexibility of thought Liveliness	4.653
on the Liveliness Landmark elements	2.373

three values of 0.01, 0.25, and 0.36 are considered as weak, moderate and strong for GOF by Wetzels et al (2009). Based on the run calculations, the value of GOF for this proposed model is 0.521, indicating a generally strong and appropriate fitness of the model.

Research Findings Analysis

Based on this proposed model, the variables' correlations are explained in a descriptive manner. Among the 10 direct and 5 indirect correlations obtained in this article, only the 4 direct and 1 indirect correlations are explained and analyzed as follows:

Analysis path 1: factor "Variety of materials" influences factor "Flexibility of thought"

In accordance with the research model in Fig.3. and Table 4, the significance level of the effect of variety of materials

Table 7: R^2 coefficients, types of variables, Q^2 coefficients, and prediction power of final relations among variables of the proposed model.

Latent variable	R^2	Effectiveness	Variable type	Q^2	Predictability
Flexibility of thought	0.739	Very strong	Dependent (Endogenous)	0.334	Strong
Various materials	0	-	Independent (Exogenous)	-	-
Landmark elements	0.120	Weak	Dependent (Endogenous)	0.065	Relatively middle
Liveliness	0.409	Strong	Dependent (Endogenous)	0.170	middle
Physical flexibility	0.235	Relatively middle	Dependent (Endogenous)	0.134	middle
Elaboration	0.603	Very strong	Dependent (Endogenous)	0.275	Relatively strong
Originality	0.690	Very strong	Dependent (Endogenous)	0.413	Very strong
Variety of visual elements	0.433	Strong	Dependent (Endogenous)	0.200	Relatively strong

factor on flexibility of thought factor is less than 0.05 and it can be deduced that "variety of materials" affects "flexibility of thought" at 95 % of confidence and is of statistical significance. In other words, the standardized path coefficient between these two factors with the value of 0.616 indicates that the variety of materials illustrates 62% of the changes in flexibility of thought in a direct manner.

Analysis path 2: Factor 'Physical flexibility' influences factor 'Originality'.

In accordance with the research model in Fig.3. and Table 4, the significance level of the effect of physical flexibility factor on originality factor is less than 0.01 and it can be deduced that "physical flexibility" affects "originality" at 99% of confidence and is of statistical significance. In other words, the standardized path coefficient between these two factors with the value of 0.563 indicates that the physical flexibility illustrates 56% of the changes in originality in a direct manner.

Analysis path 3: factor "Liveliness caused by presence of natural elements" influences factor "Flexibility of thought".

In accordance with the research model in Fig.3. and Table 4, the significance level of the effect of liveliness factor on flexibility of thought factor is less than 0.001 and it can be deduced that "liveliness" affects "flexibility of thought" 99.9% of confidence and is of statistical significance. In other words, the standardized path coefficient between these two factors with the value of 0.688 indicates that the liveliness illustrates 69% of the changes in flexibility of thought in a direct manner.

Analysis path 4: factor 'Variety of visual details' influences factor 'Elaboration'.

In accordance with the research model in Fig.3. and Table 4, the significance level of the effect of variety of visual details factor on elaboration factor is less than 0.001 and it can be deduced that "variety of visual details" affects "elaboration" at 99.9% of confidence and is of statistical significance. In other words, the standardized path coefficient between these two factors with the value of 0.777 indicates that the variety of visual details illustrates 77% of the changes in elaboration in a direct manner.

Analysis path 5: factor "Variety of materials" with the mediation of factor "Variety of visual details" influences factor "Elaboration"

Based on the research model in Fig.3. and Table 5, the

significance level of the affect of variety of materials factor on the elaboration factor is less than 0.001, thus it can be deduced that "variety of materials" with mediation of variety of visual details is affects and is of statistical significance on "flexibility of thought" at level of 99.9% confidence. In other words, the factor of "variety of materials" indirectly by the assistant of mediating variable "variety of visual elements" affects the variable of "elaboration" its standardized path coefficient with the values of 0.568, 0.777 and value %44 indicate the influence of mediating factor.

CONCLUSION

The objective of this study is to assess the effect of physical features of playgrounds on the rate of children's creativity in city parks. The research hypotheses are based on the fact that the rate of children's creativity at ages 6 to 12 depend on the physical features considered in the research principles including: variety, physical flexibility, and liveliness caused by presence of natural elements. In this study, the effects of three independent factors of 1) Physical variety with indices of various materials, various volumes and forms, spatial contrast, and sign index elements, 2) Physical flexibility with indices of space dimensions, changeability of facilities and materials, different horizontal and vertical levels, and various sitting places, and 3) Liveliness with indices of natural beautiful scenery, physical comfort, mental peace and cozy space on three dependent variables of originality, flexibility of thought, and elaboration which are among the indices of creativity are tested.

In this proposed model, the independent and intermediate variables consist of physical factors and the dependent variables are the originality, flexibility of thought, and elaboration. Based on the research hypothesis 1, it is conceived that an increase in independent variable of variety of materials and intermediate variables of landmark elements, physical flexibility, liveliness, and variety of visual elements in the playground spaces of the city parks, the children's creativity as a dependent variable increases.

In order to analyze hypothesis 2, the difference between the values of effect of the physical features on increasing children's creativity in the playgrounds of the city parks, the standardized

path coefficient between the factors in this proposed model is applied. Based on the coefficients of the mentioned direct and indirect effects and based on the correlations among the variables of this proposed model, each one of the physical factors, have a different direct or indirect affect on the children's creativity dimensions.

The results obtained on the correlations among the environmental and creativity variables indicate that the factor of variety (including variety indices in visual details, landmark elements and variety of material) highly affects most of the factors, hence a very important factor in this context. The factor of liveliness caused by presence of natural elements as an intermediate factor is affected by the factor of variety and has the highest direct effect on creativity factors including originality, elaboration and flexibility of thought.

The recommendations below are the outcome of this study:

Creating visual attractions for children through creating variety in colors, forms, and materials on the floor, ceiling, and walls of the playgrounds

Creating variety along the path by different forms, volumes, and surroundings

Creating symbolic elements like statues of national heroes and cartoon characters etc. in playgrounds and along the paths in the park Combining different artificial elements with natural elements in the park space like plants, water structures, wind and light

Determining the area of children's playground by natural elements to promote liveliness and sense of belonging for children

Providing various changeable or formable facilities and materials like sand, soil, and clay mud

Providing spaces where children can have group or individual games as well as various free space to be used as they choose

Constructing horizontal and vertical levels of playgrounds like stairs and ramps in line with increasing space flexibility for children

Observing physical comfort due to climatic changes by natural elements such as plants and water

Using natural elements like various plants and constructing water structures like fountain, streams, pools, waterfalls etc. to create mental peace for children

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