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# How does a child act in a theme park?

## Searching the role of space syntax in a child's cognitive schema

**Zeynep Tarçın Turgay**
Faculty of Architecture, PhD. Student, Istanbul Technical University
tarcin@gmail.com

**Nevşet Gül Çanakçıoğlu**
Faculty of Architecture, PhD. Student, Istanbul Technical University
canakcioglu@itu.edu.tr

**Mine Tunçok Sarıberberoğlu**
Faculty of Architecture, PhD. Student, Istanbul Technical University
tuncok@itu.edu.tr

**Abstract**

*The experience of the world that begins with the perception of the environment by human senses is followed by organized patterns of thoughts. This perceptual information is converted as memories which reach to the storage within a cognitive schema. Beginning from infancy, depending on the age and the stage of cognitive development, every individual continuously builds up a unique cognitive storage.*

*According to Piaget (1955), children, in the context of this constructive information approach, are not different from adults; they build schemata following their perceptual and cognitional processes. Their cognitive development helps them to cope with environmental stimuli and to behave in a more intellectual manner after the age of seven; which was defined as the last two stages of cognitive development. Because of the fact that cognitive development increases their capability of learning and recalling their environment, especially in the latter stages of their development it is expected from them to reflect more information in their cognitive maps.*

*Depending on this theoretical background within the scope of environment and behaviour theories, this article investigates how a thematic spatial layout for children influences their spatial cognitive schemata. An indoor theme park that presents temporal experience of a city life in a child scale is selected as the case study environment for this research. The layout of the theme park emphasized by a city centre surrounded by children sized buildings functioned with various job professions, vehicles, landmarks and related equipment, which presents little participants mimicking adult activities like performing jobs, earning money, shopping or entertaining. This thematic world raises some questions such as follows: How much do children remember the components of the environment? Are there any spatial components that are not remembered by any of the children? Does remembrance play role according to the syntactic values of spaces or the functions of spaces? How do children perceive this scaled environment and how much can they transfer it to their schemata?*

*The methodology is composed of three phases; first one is focused on behavioural data recorded by the parents tracking their children's behaviour through the visit, second one is focused on cognitive maps created by each child as individual drawings, and third one is focused on existing spatial data which is revealed by syntactic analyses of the theme park to reach significant evaluations in terms of integration, isovist perimeter and isovist area values.*

*Both the behavioural maps and cognitive maps of children are analysed and compared with the given spatial syntactic data to attain some significant results to generate an efficient debate on examining how such an environment can be associated with cognitive maps and behaviour of children. Thus, the research is projected to find out correlations between children's behaviour, memory and syntactic values of a specific physical environment.*

**Keywords**

*Children spaces, cognitive map, behavioural map, environmental perception, space syntax.*

## 1. Introduction

The experience of the world for humans begins with the perception of the environment by senses. The perceived data collected through many on-going experiences is turned into organized patterns of thoughts which form the perceptual information. When this information is piled up as memories, it is stored within a cognitive schema.

Beginning from infancy, depending on age and stage of cognitive development, every individual continuously builds up one's own unique cognitive storage. In the context of this constructive information approach, children are not different from adults; they build schemata following their perceptual and cognitive processes (Piaget, 1955). Piaget classifies the cognitive development in four stages as: (1) Sensorimotor (Ages 0-2), (2) Preoperational (Ages 2-7 ages), (3) Concrete Operational (7-12 ages) and (4) Formal operational (12+ages). He argues that while children behave with their intuitions in the former two stages, in the latter stages after the age of 7, they show the ability to cope with the stimuli coming from the environment and behave in a more intellectual manner. Because of the fact that being in a cognitive development process increases their capability of learning and recalling their environment, it is expected from them to reflect more cognitive information in their representations, especially in the latter stages of their development.

The cognitive data of the environment is stored as an organization called cognitive map, built up in a similar way both in children and adults. It can be defined as a structure constructed by the stimuli arising from spatial components which in turn reveals the cognitive process and functions as a basis for certain kinds of behaviours or judgments. According to Siegel and White, children develop their cognitive map in five steps that goes from association to structure, and as they grow up they shift from an egocentric cognitive map to a more fixed one and gain the ability to use and coordinate it (Siegel et al., 1978). Because of the fact that cognitive development increases their capability of learning and recalling their environment, especially in the latter stages of their development it is expected from them to reflect more information in their cognitive maps.

This paper handled the conception of place through its three dimensions which is discussed by Canter (1977, p.158) as "the result of relationships between actions, conceptions and physical attributes". Canter finds these three aspects necessary to be examined in correlation to each other through systematically analyses to compose a complete image of any particular place. These aspects refer to behaviour, cognition and physical setting in the concept of environment and behaviour studies.

Compatible with this statement, this research aims to compose a complete image of a specific environment by means of such a tripartite methodology that correlates objective data with subjective data through a case study in an indoor theme park designed especially for children.

Beginning with the study's tripartite methodology; behaviour mapping, cognitive mapping and space syntax methods are discussed as the theoretical part of the paper. Following that, the case study environment, an indoor theme park is presented with its functional properties and plan configuration. After presenting the methodology of the research obtained from behavioural, cognitive and spatial data analyses, evaluations are presented through regression analyses in SPSS. On the basis of these analyses, significant associations between frequency of behaviour, frequency in cognitive maps, with integration, isovist perimeter and isovist area variables are investigated. In addition to that, the frequency of behaviour and frequency in cognitive maps are compared depending on the age status.

## 2. Behaviour map as a tool for behavioural analysis in a setting

Although the design process and already decided labels of each space influence individual behaviours, the designed environment may affect the individual in different kinds of manners such as thermal, luminous, social, economic, cultural etc. (Studer, 1970). Consequently, the individual may develop certain kinds of behaviours to adapt to or even to struggle with the environment.

The interaction of the people with the environment, cannot be inferred without observation. That's why observing behaviour in a systematic way is an efficient way of analysis (Studer, 1970). The first solid theory focusing behavioural observation was Roger Barker's *Behaviour Setting Theory.* The theory intersects the characteristics of the physical space with its social aspects and presents the setting as the main affect that defines the behaviour. Barker discusses certain behaviour settings exist certain environments applying pressure on individuals to behave in such manners influenced by the social structure of that environments; such as grocery stores or a lawyer's office. The delineative role of the behaviour set the participants a component of that setting who affect the setting's transformation from the inside (Scott, 2005). Correspondingly, Proshansky et al. (1970) states that a physical setting should be regarded as a part of an enclosing social system together with the individuals who take action in that physical setting. Both of these statements include the participants in the context of "setting" and indicate that a setting should be analysed taking the participants' behaviour in consideration.

As a continuation of these approaches, behavioural mapping, a systematic analysis of behaviour, was developed to search for the relationship between the physical space and observed behaviour in that space. It is a common technique to analyse buildings in environment and behaviour studies (Peponis and Wineman, 2002) and use the data collected by observation, tracking or simulation booth (Winkel and Sanoff, 1970). Depending on the research's objectives, those data are categorised according to the setting qualities, the behaviour's intent or content (Ittelson et al., 1970; Coates and Sanoff, 1972). The behavioural maps are generated over these categories and evaluated to present the visibility, orientation, way-finding, social interaction degrees of the setting (Peponis and Wineman, 2002; Proshansky, 1970). If the setting's spatial layout is taken into consideration in the research, than the spatial configuration's relation to the subjected degrees is revealed. Therefore, behavioural map comes up as an "empirical" method because its purpose is to "describe the observed behaviour" and to evaluate it in a quantitative manner by categorising the observed data (Ittelson et al., 1970, p.659).

Besides, Canter (1977) discusses behaviour as a production and reflection of both the cognitive circumstances and features of the physical environment. He indicates the complicated link between cognition and behaviour and suggests that it is necessary to observe one's behaviour in particular physical environments in order to explore how the cognitive process of the individual is built. Thus, it would become possible for a researcher to measure people's everyday experiences through a systematic analysis and to reveal the clues of the psychology of place.

Depending on these approaches above, behaviour maps appear to be empirical tools for systematic analysis of observable behaviour and are used to present different spatial or social qualities of an environment. Also, behaviour's complicated relationship with cognition specifies it as a potential component of an overlapped analysis between behaviour and cognition. Consequently, in this study, behaviour maps are decided to be used together with cognitive maps and space syntax analyses to achieve a complete examination of a specific environment.

### 3. Cognitive map as a tool for cognitive analysis

The term "cognitive map" is associated a dimensional organization, but "map" designates only a functional analogue in this context (Downs and Stea, 2011). Its properties and construction processes were defined by many researchers likewise, regardless of various expressions as "cognitive collage" (Tversky, 1993), "cognitive space" (Penn, 2003) or "cognitive map" (Kaplan 1973a; Kuipers, 1978; Zimring and Dalton, 2003; Downs and Stea, 2011; Haq and Girotto, 2003).

The mind contains many kinds of knowledge derived and pieced together from various mental representations of the environment that are generated from environmental experience and environmental representation information (Tversky, 1993). Downs and Stea (2011, p.312) offers a formal definition to cognitive mapping as a "process composed of a series of psychological transformations by which an individual acquires, codes, stores, recalls and decodes information about the relative locations and attributes of phenomena in his everyday spatial environment". Penn (2003, p.30) uses the term *cognitive space* instead of cognitive map and defines the cognitive mapping process with two operations as "exploratory" for the construction of the cognitive space and "way-finding" for the use of this space by the individual. The recalling and decoding stages in Downs and Stea's definition and the way-finding operation in Penn's description refers to the individual's behaviour in the mapping the cognitive map as the basis for spatial behaviour (Downs and Stea, 2011) and indicate a reciprocal relationship between individual's behaviour and cognitive map.

Although differentiated in detail, cognitive maps of children are constructed through a similar order as in adults. Siegel and White present the sequence of spatial cognition development in children in five steps progressing from association to structure: noticing and remembering the landmarks, acting in the context of landmarks, route formation, clustering the routes and landmarks, developing a coordinated "frame of reference" (Siegel et al., 1978, p.226). Consistently, an experiment of Pufall and Shaw in 1973 shows that, as the child grows up from 4 to 10, he/she "shifts from an egocentric to a more fixed frame of reference", gains the ability to use that frame and coordinates his/her cognitive map (ibid., p.236).

Kaplan (1973a, p.276; 1973b) discusses cognitive map as a product of experience, serving the necessity of having an overall conception of the environment in the mind, by being the complementary structure of "many possible situations and the relations between them". He argues that this "map or model of the environment" should have a "non-planar network-like" structure in which any point is connected to numerous other points. This structure is defined as "schematic, sketchy, incomplete, distorted, and otherwise simplified and idiosyncratic", complex, selective, rich and comprise some group similarities (Kaplan, 1973a, p.276; Tversky, 1993; Downs and Stea, 2011). Thus; cognitive map can be handled as a structure mainly built up through topological relations of environmental attributes, regardless of their exact size, scale or real shape (Kuipers, 1978; Zimring and Dalton, 2003; Penn, 2003).

A common tool for analysing cognitive maps is sketch maps, which is also used for analysing how people perceive, recognize or act in an environment (Kim and Penn, 2004). In the condition of the sketch maps drawn by the individual who takes action in the setting, then this map can be considered to be a representation of a map in the head, in other words the cognitive map (Canter, 1977). These maps can be used as reliable indicators of people's spatial cognitions (Haq and Girotto, 2003), since the individual's cognitive schemata may underlie his/her sketch map (Kim and Penn, 2004). To this respect, analysed and evaluated sketch maps are also called as cognitive maps, depending on their strong relation with the cognitive schemata in the head.

Externalized cognitive maps are differentiated from conventional maps by their non-metric information, incompleteness, range in scale and distorted representations. They are also sometimes too simple, highly selective and augmented. These typical differences sometimes are taken as valuable data presenting how people perceive and represent their environment. They have the potential to provide spatial information such as the number of features, the topological relations between that features, the dominant functions, and sequence and/or number of segments along the routes (Haq and Girotto, 2003; Kim and Penn, 2004).

Although the construction processes are similar, cognitive maps of children show some typical errors and distortions compared to adults' since the cognitive process of children is dependent on age status and their representational capacities are various.

Accordingly, cognitive map is a structure constructed by a process called cognitive mapping that has two main operations; one comprising exploratory operations of perception and cognition, and one comprising the performing operations of spatial behaviour and cognition for a deeper understanding. Their structure is based on mainly topological relations and has a distorted, incomplete and idiosyncratic form and they serve as an overall conception of the environment. The cognitive maps appear to be the main sources of the verbal, written or graphical expressions regarding the space and the individual behaviours performed in that space. As a result, their representations are used as a common tool in cognitive studies.

## 4. Space syntax as a tool for spatial configuration analysis

Space syntax theory is developed by Hillier and Hanson in 1970's, in order to describe and measure the spatial configuration properties of the urban space (Long et al., 2007). It is a set of techniques for representation, quantification, and interpretation of the spatial configurations of buildings and settlements in various scales (Peponis, 2001).

A spatial configuration can be grasped in two ways, one cognitional and one behavioural. First one is through a representation of that space, a plan diagram, which allows us to grasp the whole setting all at once. Second one is through movement, which happens in time, *on the ground* by personal experiences (Rashid, 2012). As a result, in some researches evaluate the syntactic data together with behavioural or cognitive data to search the interaction between the physical space and the individual (Penn, 2003; Kim ve Penn, 2004; Haq& Girotto, 2003; Tuncer, 2007; Unlu, 2001). The techniques usually analyse the integration, depth and isovist values of the spaces.

In the scope of this study, syntactic data obtained from integration and isovist outcomes are used to search the relationship between spatial configuration, participant behaviour and cognitive maps through regression analyses.

## 5. Case study

Moore (1987) deals with the notion of physical environment as an important medium for transactions such as exploring, discovering, testing and initiating for children. As it was stressed by major theories on children like those of Piaget (1955) and Montessori (1965), the interaction of children with their environment is the basis of their development, thus having an active role on their own development. Additionally, in case of the age group of 3 to 12, the environment should present children such a poly-sensorial physical setting motivating them to learn with play. As a result of this specific need of children to be in environments that offer many resources (Moore, 1987), both institutional environments like kindergartens, schools and etc. and non-institutional environments like playgrounds, parks, zoos and etc. which are used by children are designed in appropriate scale, with proper safety conditions and materials for their performances.

Despite the fact that the most stimulating environment for children is the nature itself, the children who are living in metropolitan cities especially cannot find widely spread outdoor opportunities. Unfortunately Istanbul is also one of those cities that do not offer enough outdoor activities for the young citizens. The children especially from middle and upper income groups spend a significant part of their spare times in shopping malls, with their parents. Therefore, shopping malls tend to be designed with increased recreational and entertainment areas for children to attract visitors having children.

Such a novel large scale indoor activity setting, which is selected as the case study environment in the scope of this paper, is a theme park within a shopping centre in Istanbul. Built on approximately 7.500 square meter area, this setting is designed as a small scaled city, equipped with streets, sidewalks, little vehicles, buildings and 'establishments' sponsored by outstanding national and international brands functioning in Turkey (Figure 1). It offers children the experience of performing more than 50 'jobs' as in the real world through a role-playing performance in which children are either paid for their work, or pay to entertain and buy. This performance of children is also named as an 'edutainment' activity which is a new terminology originated by the world-wide theme park institution uniting the concept of education with entertainment.

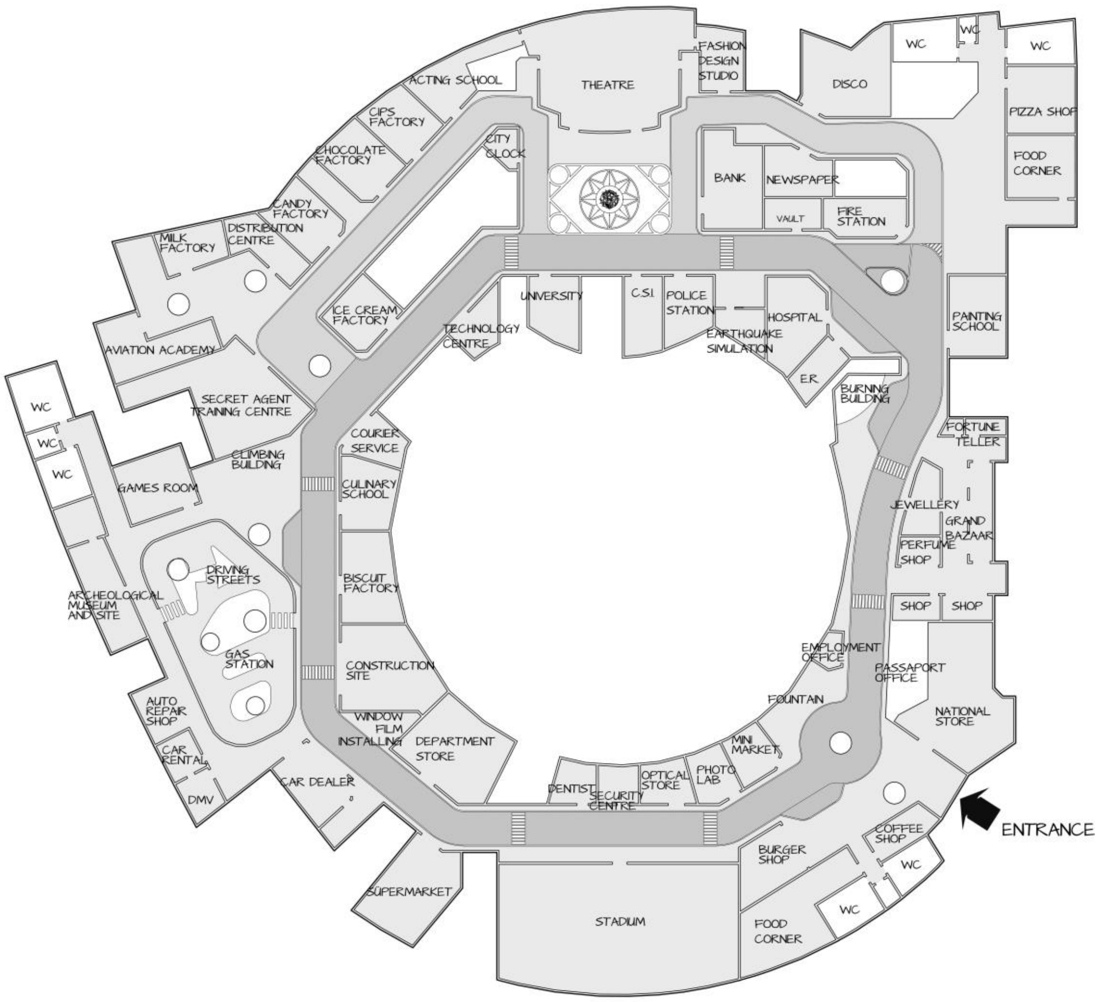


**Figure 1.** Plan of the indoor theme park showing activity areas

The park has a circular plan type that consists of a main circular route and two secondary loop like routes that intersect the main route with two small, one big size squares. Most of the activity areas were located on the both sides of the main and secondary routes. The main square in front of the theatre is accentuated by a Christmas tree, and two other squares are also accentuated by trees. All the three squares are planned as waiting areas for parents, and the entrance area is planned as a meeting point by placing a landmark, a fountain. The areas in the deeper parts of the layout serve as toilets and do not follow the main circular plan shape.

It is observed that the children in Turkey seem to be very attracted to this new type of entertainment since they have are already been exposed to television commercials before their actual visits. At the beginning of the visit, the children's attention is kept alive by the brochures which represent the four activities (construction worker, doctor, pilot, secret agent) and the massive plane model in the entrance. During the visits the social factors such as experiencing alone, meeting a new friend, experiencing the environment with a best-friend or earning much more money help children to pursue their motivations to experience more activities.

**6. Methodology**

Compatible with Canter's (1977) conception of place, this research has a tripartite framework based on the three aspects of the place as actions, conceptions and physical attributes. These aspects are regarded as the behavioural, cognitive and physical attributes of an environment, as represented in the environment and behaviour studies. All three attributes are researched via behaviour maps, cognitive maps and syntactic analysis of the physical setting.

On the basis of the literature review on behaviour map and cognitive map analyses depending on their content about spatial configuration, (Kim, 2001; Evans, 1980; Tuncer, 2007; Tversky, 1981; Haq and Girotto, 2003; Kim and Penn, 2004) physical elements, (Lynch, 1960; Long et al., 2007, Haq and Girotto, 2003; Kim and Penn, 2004) or participant or map characteristics (Haq and Girotto, 2003; Kim and Penn, 2004), it is also projected to make a contribution to the research are that investigates the possibility to intersect the real environment data with cognitive data.

In the case study, the participants are selected as children corresponding Piaget's *concrete operational stage* and were invited to and informed about the study via e-mail. The study was conducted with 23 voluntary participants including 8 males and 15 females aged between 6 and 12, with one of their parents. According to pre-scheduled date and time, all participants attended to the study at the same time and informed again.

At the time of the case study, there were 56 activity areas serving actively in the park. 2 areas that were closed, 2 areas for the children designed for the 0-3 age group, and 'Bank' were eliminated from the behavioural data. The spatial and behavioural data sets were evaluated through 51 activity areas, leaving out food court areas and toilet spaces.

Along the participant data; 5 children were eliminated from the study depending on their insufficient track charts or cognitive maps. The data set was evaluated from the 17 children including 5 males and 12 females aged between 6 and 12.

The tripartite methodology of the article can be summed up as follows:

(1) In the first session, the data set considering the behaviour maps are obtained from the ready prepared track charts filled by the parents accompanying the children.

(2) In the second session, the data set considering the cognitive maps is obtained from the drawings of the children who are requested to draw a picture of what they remembered from the three hour session. The drawing session lasted for 30 minutes and the children were informed to feel free to use texts to present the areas that they can draw or cannot draw.

(3) The third data set considering the spatial analysis are obtained through the analyses of the park's configuration. Integration, isovist perimeter and isovist area values are taken into consideration calculated by the grid value from the gate of the each activity area via *depthmap software*.

In the evaluation phase, it is applied to regression analyses to search significant correlations between frequency of behaviour, frequency in cognitive maps and the variables of integration, isovist perimeter and isovist area values. In addition to that, the frequency of behaviour and frequency in cognitive maps are compared depending on the age status.

**7. Results and discussion**

The frequencies of the behavioural data and cognitive data are presented in Figure 2 as a bar chart, and in Figure 3 over the plan layout of the theme park.

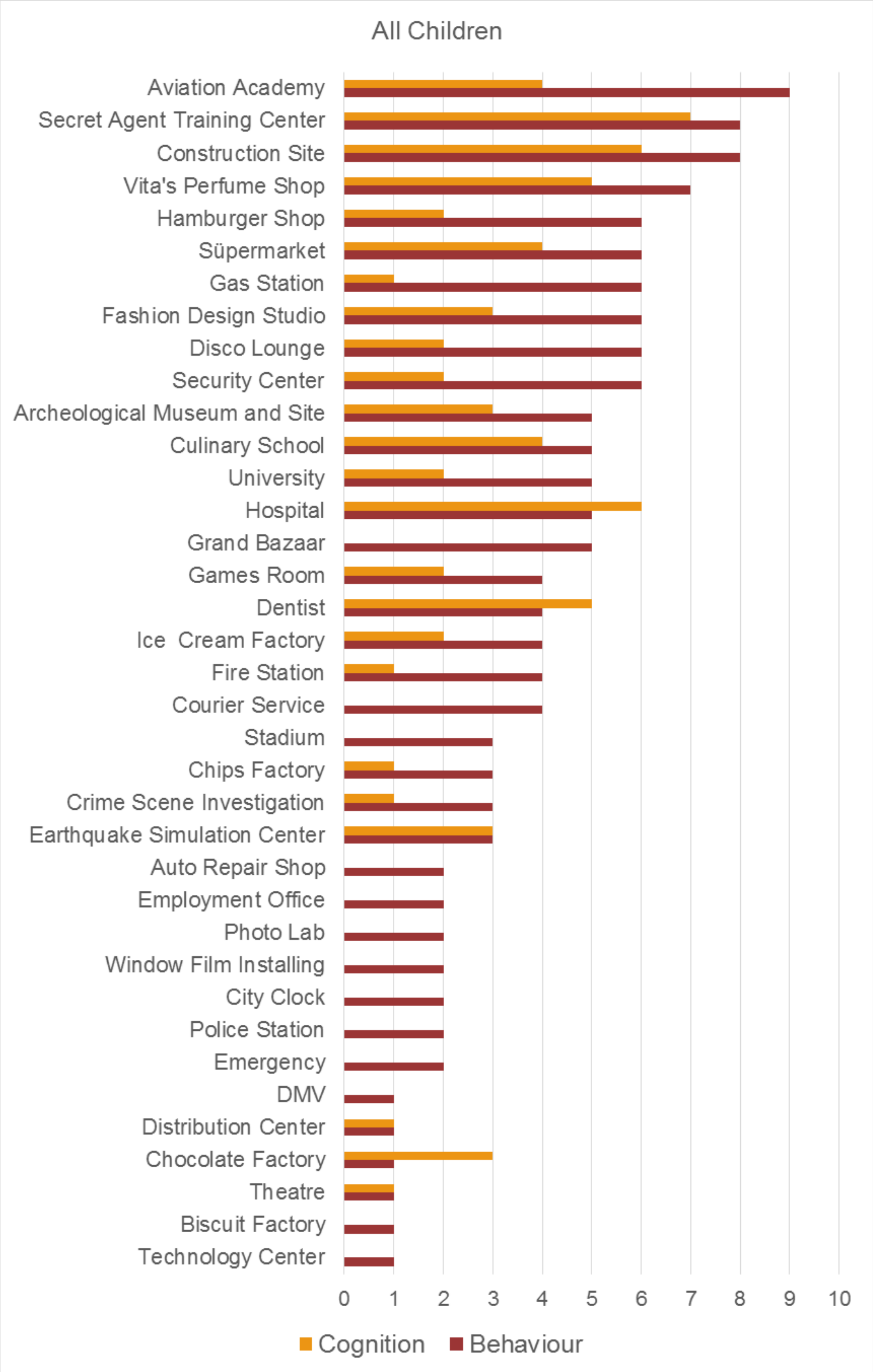


**Figure 2.** Frequencies of all participants' cognitive and behavioural data

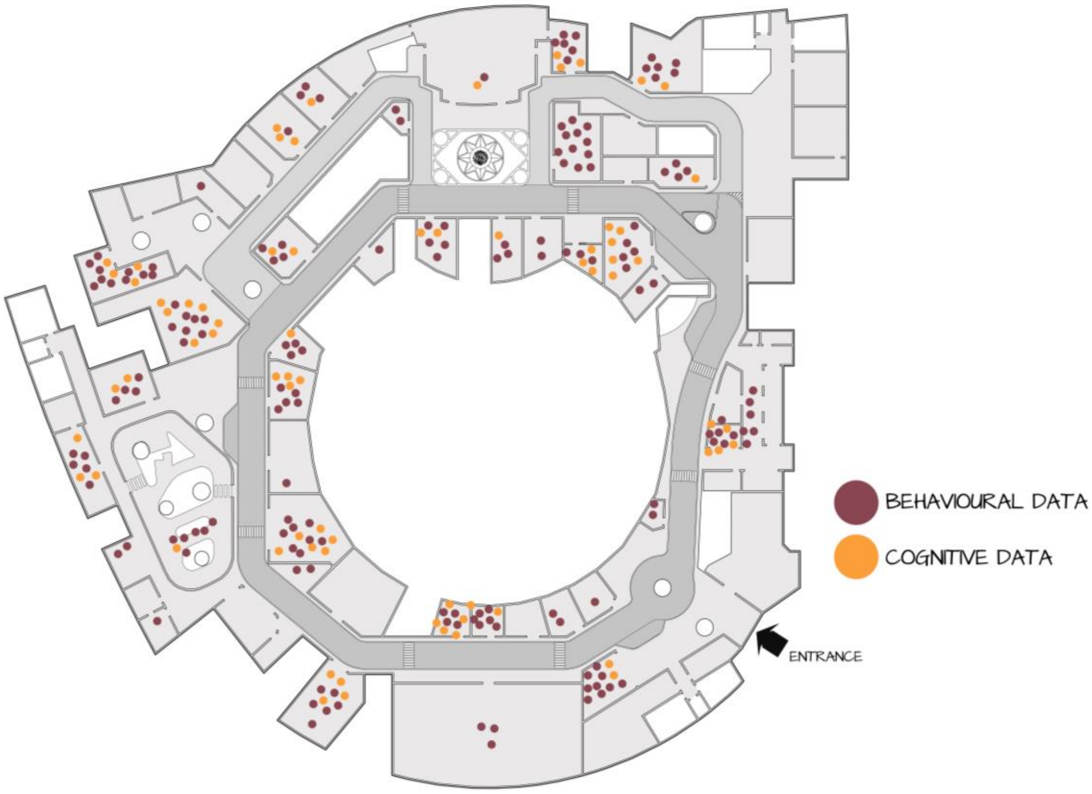


**Figure 3.** Behavioural data and cognitive data overlapped on the existing plan.

Considering the behavioural data, *Aviation Academy* is the most preferred activity area, followed by *Secret Agent Training Centre* and *Construction Site*. Through 51 activity areas of the park, while 37 (73%) activity areas were visited, 14 (27%) activity areas were not visited.

On the other hand, considering the cognitive data, *Secret Agent Training Centre* is the most represented area, followed by *Construction Site* and *Hospital*. Through 37 visited activity areas, while 24 (65%) activity areas were represented in the cognitive maps, 13 (35%) activity areas were not represented. In addition; 6 activity areas; *Dentist, Hospital, Distribution Centre, Earthquake Simulation Centre, Theatre* and *Chocolate Factory* were represented in cognitive maps of the children who actually did not visit these areas.

The correlation between the behavioural and cognitive data presents that the children remember and represent mostly where they have visited but the frequency differs depending on the function of the activity area and the age status.

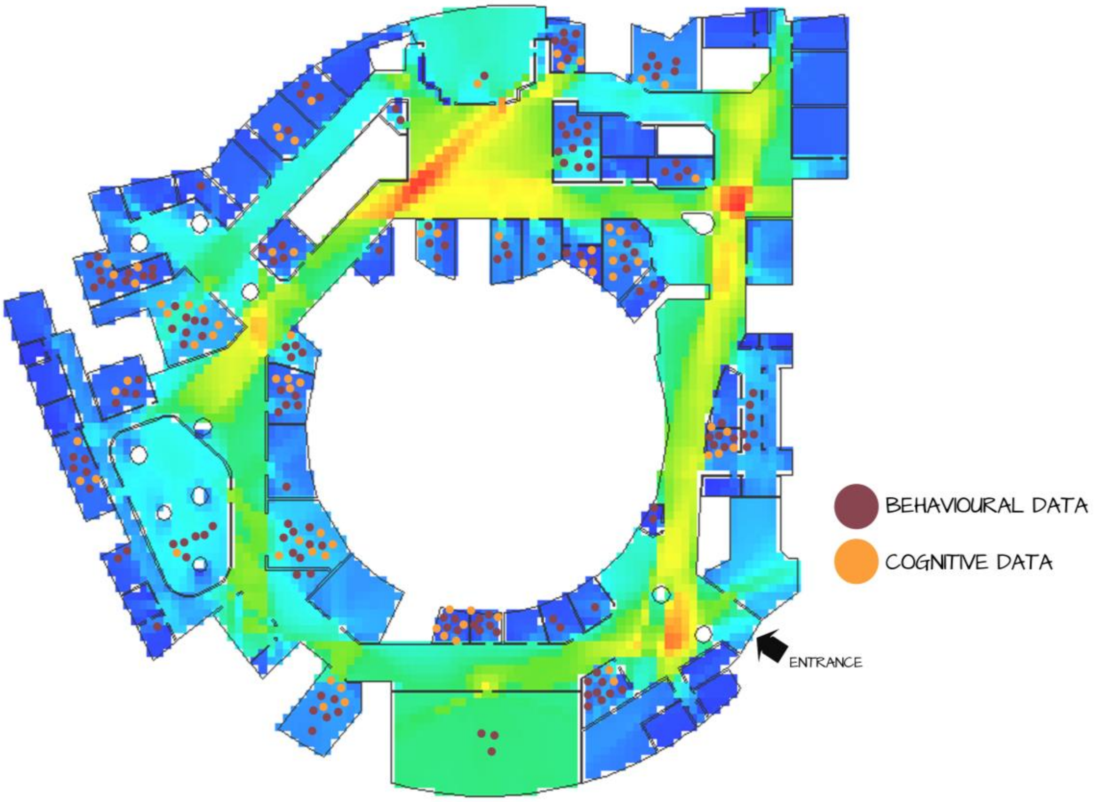


**Figure 4.** Syntactic analysis showing integration value together with behavioural and cognitive data

In Figure 4, the behavioural and cognitive data are represented as different coloured dots over the integration map obtained from *depthmap* software to exhibit an overlapped image of the three data sets. The figure presents that almost every activity area on the circular route possesses similar depth values. The circular route on the other hand, possesses a shallower degree of integration compared to the activity areas (Table 1); having 4 significant areas possessing the highest integration values. The most integrated area is the main square in front of the theatre, and the other three areas are the entrance and the secondary squares. All of these areas are the ones also characterized by theatrical landmarks, as a part of the architectural design which serve as waiting areas for parents.

| ***Item*** | ***Highest*** | ***2nd highest*** | ***Lowest*** | ***2nd Lowest*** | ***Average*** |
|---|---|---|---|---|---|
| integration value of activity areas | 37,0 | 7,31 | 0,49 | 0,72 | 44,20 |
| isovist perimeter value of activity areas | 0,31 | 0,30 | 0,06 | 0,07 | 0,19 |
| isovist area value of activity areas | 50,70 | 50,44 | 5,94 | 7,87 | 30,18 |

**Table 1:** Integration, Isovist Perimeter and Isovist Area values summary

The numerical findings in Table 1 indicate that the children's frequency of behaviour do not show a significant correlation (Table 2) with any of the syntactic values of the layout (frequency of behaviour; integration value: $r^2$=-0,17, r=0,211 - frequency of behaviour; isovist perimeter: $r^2$=-0,105, r=0,442 - frequency of behaviour; isovist area: $r^2$=-0,139, r=0,309). This result can be interpreted as the children are mostly affected by non-spatial variables, such as stimulating commercial images they were exposed previously.

| ***Item*** | ***r*** |
|---|---|
| frequency of areas in the cognitive maps; integration value of spaces in real setting | 0,236 |
| frequency of areas in the cognitive maps; isovist perimeter value of spaces in real setting | 0,076 |
| frequency of areas in the cognitive maps; isovist area value of spaces in real setting | 0,107 |
| frequency of behaviour in the real setting; integration value of spaces in real setting | 0,211 |
| frequency of behaviour in the real setting; isovist perimeter value of spaces in real setting | 0,442 |
| frequency of behaviour in the real setting; isovist area value of spaces in real setting | 0,309 |

**Table 2**. The Association between Spatial Configuration of the Setting with Behaviour Maps and Cognitive Maps

The children's frequency of areas in the cognitive maps do not show a significant correlation (Table 2) with any of the syntactic values of the layout either (frequency of areas in cognitive maps; integration value: $r^2$=-0,161, r=0,236 - frequency of areas in cognitive maps; isovist perimeter: $r^2$=-0,239, r=0,076 - frequency of areas in cognitive maps; isovist area: $r^2$=-0,218, r=0,107). This result can be interpreted that the children are mostly effected by non-spatial variables, such as the function of the activity area primarily, together with other independent variables; age, gender and personal interest.


**Figure 5.** Examples of cognitive maps 9-12 age group (Girl,12 and Girl, 9).

**Figure 6.** Examples of cognitive maps 6-8 age group (Girl, 7 and Girl, 7).

After concluding with insignificant results from the correlations between selected variables, it is focused on to reveal some of the tendencies which are clearly observed through bar graphs. The findings and interpretations of these tendencies are listed below.

- The most represented area in cognitive maps is the *Secret Agent Training Centre* containing the enjoyment figures in drawings such as jumping, laser tunnels, etc. (Figure 5 and Figure 6) *Construction Site* and *Hospital* are the second most represented activity areas, offering similar experiences.

- *Bank* was not represented in any of the cognitive maps although it is a mandatory place to be visited in order to perform the rest of the activities.

- None of the integrated areas were represented in the cognitive maps, even though their integration values are significant.

- Depending to these results, it could be stated that, the cognitive maps are mostly based on the children's experiences in each of the activity areas or on their emotional reactions which cannot be measured. Even though most of the areas have similar syntactic values, children get attached to some of them whether they attend it or not. In addition if they experienced an activity, then the quality of the experience affects if that place is transferred to their cognitive schema. For instance, *Secret Agent Training Centre*, *Construction Site* and *Hospital,* are offering full participation or production. On the other hand, the *Aviation Academy* only offering a simple simulation like a videogame, was not represented in most of its visitors' cognitive maps since such an activity does not offer the child a total physical experience.

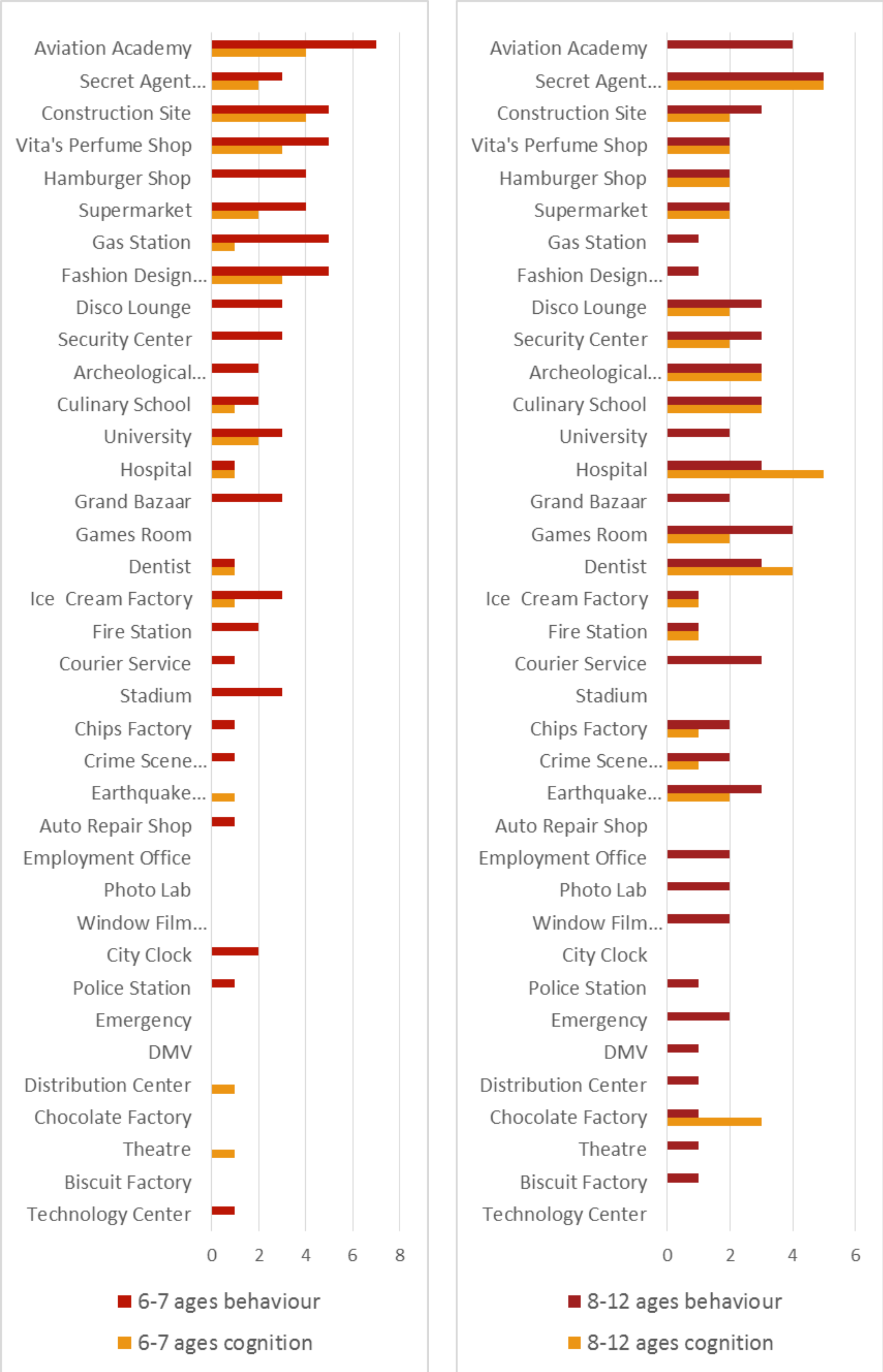


**Figure 7.** Graph showing the behavioural data together with the cognitive data of the age groups of 6-7 and 8-12.

A conspicuous second tendency is considering the correlation depending on age status. The bar graph results are evaluated as two subgroups in concrete operational stage; 9 of the children were analysed as the 6-8 aged group, 8 of the children are analysed as the 8-12 age group.

- 6-8 age group had visited 26 activity areas and had drawn 28 separate activity area representations in total, comprising 12 (46%) of the activity areas.On the other hand, 9-12 age group had visited 33 activity areas and had drawn 43 separate activity area representations, comprising 18 (54%) of the activity areas.

  In other words, 9-12 age group of children represented more number of activity areas in their cognitive maps and 6-8 age group represented mostly one or two activity areas in theirs (Figure 5, 6 and 7).

- Both 6-8 and 9-12 age groups of children drew 3 different activity areas even though they did not visit those areas. 6-8 age group drew *Distribution Centre, Earthquake Simulation Centre* and *Theatre*, 9-12 age group drew *Hospital, Dentist* and *Chocolate Factory* (Figure 7).

- Depending on these findings, the gap between the frequencies of the areas in cognitive maps of each age group is interpreted as an outcome of their cognitive difference. The Piagetian theory indicates that children at the concrete operational stage actually construct the cognitive representations of large-scale space with navigation in the space. In this respect, 9-12 age group children may represent the navigational properties of the park (Figure 5), while the 6-8 age group children, still having a more egocentric approach, may represent one or two distinct spaces that they are most interested in (Figure 6).

**8. Conclusion**

In this study, a thematic spatial layout's influence on its young participants' cognitive maps is investigated by a tripartite methodology that correlates behaviour maps, cognitive maps and space syntax values to analyse the selected physical setting through an accumulative manner.

The insignificant correlations between the syntactic values and the frequency of areas in the cognitive maps and frequency of behaviour indicate that the children's behaviour and cognitive maps are mostly affected by non-spatial variables about the environment and the children's individual characteristics. However, to reach to more consistent data about the special designed children environments, additional case studies should be conducted in terms of the cognitive dimensions of children.

The first observed tendency indicates that the experience in an activity area and the emotional reaction to that experience can be noticed significantly in the cognitive maps. Additionally, the second observed tendency indicates that; 6-8 age group of children still tend to reflect their cognitive outcomes through a more egocentric approach, reflecting only one space in their cognitive maps, compared to 8-12 age group of children, although 6-8 age group of children are classified in the same cognitive developmental stage; concrete operational stage in the concept of Piagetian theory.

As a secondary interpretation, the insignificant role of the spatial configuration on children's behaviour is partly dependent on its circular characteristic. As an outcome of the radial location of the activity areas, having the same distance to be reached from the main route, children feel that they are in the equal distance to every activity and they participate an activity in a conscious manner, according to their individual characteristics. In other words, the functions of the areas were observed to be more outstanding compared to their certain locations within the layout.

In conclusion, the behavioural and cognitive analyses shed light on the syntactic analyses of this children based environment. The spatial configuration of this thematic layout without any significant integration or isovist value is seemed to be used and remembered through its functions even though it is specially designed for its participants' physical scale. An attitude synthesising methodologies of behavioural, cognitive and syntactic researches is appeared to have a potential to reveal the insufficiencies of environments designed specifically for children; and subsequently may lead an innovative way of design for appropriately stimulating environments for children.

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