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DESIGN PRINCIPLES OF RESIDENTIAL OPEN SPACES TO PROMOTE CHILDREN'S SATISFACTION

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ABSTRACT

Over the past decades, a global vision of considering children and their rights in all aspects of their lives has raised. Given that the residential environment is a platform for children's development, it is necessary to identify the optimum design principles of residential open spaces in order to enhance children's space satisfaction. Due to one-dimensional and quantity-oriented attitude in residential complex design, the contemporary architectural culture has not paid enough attention to this fundamental issue in residential environments. According to this problem and the interaction between the quality of the residential environment and the quality of life of residents, it is necessary to provide a systematic and comprehensive definition of the children's place satisfaction in residential complexes. This study aims to provide solutions to enhance the quality of residential open spaces based on the recognition of children's satisfaction with the residential environment. It develops theories in relation to satisfaction and explains the interrelationship between the two components of "fundamental features of the residential open space" and "satisfaction" as a systematic organization for planning and designing of residential space. By using content analysis, it seeks a concept of satisfaction and determines children's satisfaction levels and parameters with residential spaces based on logical reasoning.

Keywords: *Satisfaction, Children, Place, Residential Open Space*

INTRODUCTION

In recent years, children cannot be seen frequently in open areas and residential spaces. Today, children spend most of their time inside their homes or in extracurricular activities. Interference of pedestrians and cars traffic, overpopulation, insecurity and disorganization of urban spaces, and incompatibility of spaces with the requirements of children in many urban districts and residential complexes have caused a change in their activity pattern.

Children have become accustomed to playing computer games and it has resulted in reduced physical activity, while physical activity is considered to be necessary for natural growth and physical and mental development of children. Apparently, such an alarming change in daily life habits of children has been caused by having a negligible attitude towards the concept of childhood and conditions of residential spaces. A child starts spending time with peers and interacting with adults in a residential open area for the first time. This provides an effective condition for playing and forming activities with the growth of children in physical, mental, social, and psychological aspects and forms their personality. Presence at residential open spaces allows children to learn, apply knowledge, and coexist and interact with others. The whole environment plays the role of an instructor. Active presence of a child in a society and encountering different issues are as important as a final result. The way each problem is dealt with and analyzed is as effective as the final answer itself in the child's mental growth.

Experts defined child's education as the product of interaction of nature-training, inheritance-environment, and nature-experience (Shoarinejad, 2000). The definition specifies the dominant role of an environment on a child. Although it cannot be expected that all urban components are corrected and equipped to suit the physical and mental conditions of a child, it is necessary to provide an environment that meets their needs and activities in the spaces like open spaces of residential complexes. Such environments may play a major role in the appropriate growth and development of a child.

Research Article

Most behavioral abnormalities in urban societies such as violence, aggression, violation of the rights, and trespassing rules have historical, cultural and economic roots and lie in quality of residential and business environments (Rahnamaei *et al.*, 2004). This clarifies the necessity of environment adaptation for children more than ever, which means providing conditions for reducing harms, increasing motion, and providing emotional and behavioral comfort.

In this paper, children's 'residential open space' refer to community open spaces and communal facilities in a residential complex that children consider as being especially important to them in terms of psychological, behavioral, and symbolic meanings. The quality of outdoor spaces in a residential complex affects the quality of life of its residents. A wealth of past literature has dealt with children outdoor activities as part of their growing up process (Evans, 2006). Lack of appropriate design criteria for the design of residential spaces, including the psychological needs of children and their psychological and spiritual realities caused their potential talents could not grow well (Faizi *et al.*, 2012). These issues are especially relevant in middle childhood (between 6 and 12 years of age), when children explore their neighborhood most extensively (Chawla, 1992).

The basic question is: What conditions of the outdoor environment can contribute in promotion of children's satisfaction toward space.

The hypothesis of the research suggests that if interventions are made in the residential open spaces, children's place satisfaction would be encouraged. The researchers seek to cherish social, emotional, and cognitive development through specific variables criteria and indicators. The necessity of this research is based on the following premises: 1) One of the great but often unmentioned causes of both happiness and misery is the quality of our environment (De Botton, 2008). Therefore improvement of the quality of these spaces has a significant impact on children growth and social interaction; 2) Children activity spaces, particularly the outdoor near home spaces, play major role in children's life experience and development. What the spatial environment offers could influence their wellbeing (Abdul *et al.*, 2012); 3) changes in this environment can bring about changes in their behavior, and ultimately their development (Moore, 1986).

Therefore, recent research looking for a set of elements of residential space designed to achieve a positive impact on child's psychology, and make him to be happy and satisfied, so that the accomplishment of those elements in the design and construction, especially residential open spaces, child's place satisfaction will be stimulated.

MATERIALS AND METHODS

Methodology

As the research topic is theoretical, it was conducted through studying documents and literatures. The major references included specialized books and journals, related research projects, and Global Information Network. Considering the nature of research data, it is conducted as a qualitative research.

Place Satisfaction

Environmental perception is the basis of satisfaction with the quality of the environment. Environmental perception is a process through which human adopts the necessary data based on his needs from the environment (Motalebi, 2002).

Most residential satisfaction studies have integrated both objective and subjective attributes for the assessment of residential satisfaction.

Francescato *et al.*, (1987) contend that satisfaction depends on three elements. The results were enumerated as follow:

- The design which includes its space organization, layout and facilities provided
- The management practices (in public housing)
- The surrounding social aspects

Based on their studies on public spaces, Djebuarni and Al-Abed introduced residential satisfaction as an important indicator and pointed out the following results as ways that this important indicator can be used by planners, architects, developers, and policymakers in designing a public space:

Research Article

- A key predictor of an individual's perceptions of general "quality of life"
- An indicator of incipient residential mobility and hence has altered housing demands and affected neighborhood change
- An ad hoc evaluative measure for judging the success of developments constructed by private and public sectors
- An assessment tool of residents' perceptions of inadequacies in their current housing environment in order to improve the status quo (Djebuarni & Al-Abed, 2000)

In several studies on the satisfaction level of Roman citizens with the neighboring environment, Bonaito *et al.*, concluded that satisfaction is related to below characteristics:

- Physical aspects (appearance of mass and space, environmental performance and the presence of nature)
- Social aspects (people and social interactions)
- Functional aspects (public services, recreational services, business services, transport services)
- Contextual aspects (health and maintenance)

In a global study on the perceived quality of residential environment in Italy, Bonaito *et al.*, (1999 and 2006) considered eleven criteria in four groups as below:

- Three units associated with spatial aspects as below:
 - Planned-designed space
 - Layout and space availability
 - Green areas
- One unit related to human aspects as below:
 - public and social relations
- Four units associated with functional aspects as below:
 - Insurance
 - Recreational
 - Economic
 - Transportation services
- Three units in relation contextual aspects as below:
 - Lifestyle
 - Environmental hygiene
 - Maintenance

To evaluate sense of satisfaction in public housing of Madrid, Spain, Amerigo and Aragonés (1990) defined successful public spaces with below characteristics:

- Area of space
- Social interactions
- Security
- Infrastructures
- Communication with the surrounding world
- Urban activities
- Open natural space

Amerigo and Aragonés (1997) tried to identify behavioral models that are significantly related with satisfaction of residents. Results showed that, in general, residents who did not attempt to improve their homes or did not react to the most important issues of their place were more satisfied than other people (presumably, the need for measures to improve the situation indicates dissatisfaction). Moreover, participation in neighborhood activities and frequent meetings with neighbors is highly correlated with residential satisfaction (Amerigo and Aragonés, 1997).

Canter (1997) considers three main components in assessing residential space as below:

- Space aspects (architecture and urbanism)
- Human aspects (e.g. social relationships)
- Functional aspects (services and facilities)

Research Article

More recent empirical research such as research of Bonaito (2006) and Aiello and Ardoneh (2010) added a fourth dimension to Canter's model including contextual variables such as lifestyle, population and maintenance.

Some scholars have described the understanding phases of people's satisfaction with the conceptual point of view, i.e., the individual evaluates his/her present residential situation (housing unit/neighborhood unit) with a set of needs and desires (Michelson, 1966). Individual needs and aspirations are a collection of both individual characteristics (such as social class, stage of life, etc.) and cultural factors influencing the individual (Schmid *et al.*, 1979).

Satisfaction is achieved if the current situation is consistent with what the individual has defined for his/her needs and aspirations. Theoretical underpinnings on residential satisfaction are based upon the idea that residential satisfaction measures the difference between households' actual and desired/aspired housing and neighborhood situations (Galster, 1987). Stedman (2002) defined place satisfaction as a multi-dimensional summary judgment of the perceived quality of a setting, meeting an individual's needs for the physical characteristics of a place, its services, and social dimensions.

Reviews of studies on neighboring and residential satisfaction showed that several variables can affect user satisfaction with the residential environment. The most important variables include social interaction (Amole, 2009), beauty, existence of natural areas (Amole, 2009; Hur *et al.*, 2010), safety of services and facilities, and environment comfort (Gaitani *et al.*, 2007).

What is derived from the analysis and evaluation of residential open spaces qualities and the study of literature in this regard is the interconnected and inseparable link between some environmental qualities. In other words, environmental qualities such as safety, security, pedestrian orientation and socialization are equally involved in promoting environmental quality.

Residential Complex's Open Space and Children

With the growth of urbanization, cities have become less accessible for children and they fail to satisfy children's needs. Meanwhile, the prevailing apartment dwelling lifestyle and limitations for facing with natural environments have hindered children to be in nature and communicate with it. Family, educational, and public spaces are three environments that satisfy a child's needs for socializing. Some children stay in often small residential units and have no recreations in the clamor of living in an apartment with small, dark, and depressing units but watching TV, working with computer, studying and probably playing with sisters and brothers. They face urban open spaces, which are no longer considered as safe and secure places for free presence of children due to machinism in cities and being away from anthropocentric characteristics.

Child-driven free play, the kind of play that usually occurs in neighborhood outdoor spaces, offers unique developmental benefits. It contributes to the physical, cognitive, social, and emotional development of children, and can help them develop protective assets and increased resiliency (American Academy of Pediatrics, 2007).

Residential open space is a place of interaction, communication, and expression that can be accessed by children. As a part of the built environment, they can respond to the basic needs of children, and by attracting them, they can make attachment and vitality in the environment. More ever, they have several functions as below:

- Social: as place where children play a game or sport, in order to socialize, interact and communicate to others
- Recreational: as a place to travel, and find something fun and enjoyable
- Ecological: freshen the air, improve the micro climate, absorbing rainwater and providing light and air circulation to the surrounding
- Educational: children expected to find new educational leisure (Hakim, 2003)

Residential open spaces are allocated to major part of children's daily life. According to Moore and Wong (1997), play in outdoor environments stimulates all aspects of children's development more readily than indoor environments. Moore (1986) also claims that children who play in nature have more positive feelings about each other. This outdoor life experience is vital for children. The longer the outdoor

Research Article

experience the children have, the higher benefits of developmental learning they encounter (Hattie *et al.*, 1997).

As each activity needs an environment with specific features or a suitable behavior setting, lack of the said environment undermines the quality of the activities, which finally disrupts the existence of the environment from different aspects. Therefore, it is of paramount importance for designers to provide and promote quality of the required environments for activities. The concept of *behavior setting* was first developed by Roger Barker *et al.* to study “developmental psychology” in order to analyze social and anatomical psychology of children. A behavior setting is a small social unit, which is formed by a stable combination of an activity and an environment in a way to satisfy the necessary performances of that behavior environment. Behavior setting is like a living system with the following features (Lang, 1987):

- **Repeatable Activity:** It takes place in residential open spaces as a behavior setting for leisure time and different activities such as relaxation and motional activities such as recreation, exercise, games, and interaction with individuals.
- **A Special Plan of an Environment or a Milieu:** Individuals use different places in urban open spaces in their leisure time and typically affect the system’s setting according to their age, gender, interests, etc. For example, sitting beside children playground improves parents control over current behavior pattern of children and sitting near platforms and cozy places establishes interactions between individuals and intensifies this behavior.
- **Homology:** A space-behavior will not be formed without connecting a milieu and human behavior. The current pattern of behavior in urban open spaces includes exercise, recreation, personal interactions, etc. Furthermore, a milieu or an urban space should be capable of creating and presenting this behavior.
- **Period:** Each behavior setting may consist of several settings and different behaviors take place in them in different periods.

In addition to the abovementioned features, by having a plan and a controlling factor, a behavior setting enables an individual to reach satisfaction; and this state varies in different individuals. A behavior setting or a place may help an individual to achieve self-actualization and the same place may satisfy fundamental needs of other individual. A behavior setting may meet diverse needs of an individual in different periods. For example, an urban space may meet citizens’ needs at a certain time and satisfy an individual (Falahat and Kalami, 2008).

Activities do not take place in a vacuum; therefore, the occurrence of all events is related to a milieu. Human behavior is closely related to the environment. Therefore, human behavior organization and its implementation in a period and place is the most critical factor in designing an open space. Human is the major element of this space and gives meaning to it through his values and norms. Open space design is the art of organizing an external physical environment to support human behaviors.

Understanding the Characteristics and Needs of Children in Residential Open Space

Satisfying social needs of children and providing required opportunities for gaining social experiences require a physical space and setting capable of paving the way for including and maintaining individuals in the space. Here, some features like visual attractions, accesses, natural and virgin elements, and variation and ability of an environment to offer different activities can be mentioned.

Today, in highly dense urban environments, children’s interaction with nature is declining (Rivkin, 1995). Lack of landscaped outdoor spaces and the synthetic atmosphere of play areas have contributed to the loss of children’s contact with nature (Herrington & Studtmann, 1998). Outdoor open spaces in urban areas associated with natural elements could become the primary places for children to gain experience with nature.

In the planning and design of the space, one must recognize and respect the different aspects of the space, in addition to the characteristics of the space users, and their needs and behavioral characteristics. Meeting the needs of children plays an important role in the formation and development of their character.

For the formation of architecture theoretical basis and design frameworks, a model of children needs is required to systematically explain the complexities of human behavior. In this regard, it is necessary to

Research Article

correctly know psychological and physical needs. Children's physical needs can be met according to the building function by designers and by identifying similar standards and functions. But in the realm of psychological needs, the designer must base his/her activity on a psychological model of human needs. To design a space consistent with the needs of residents, first the designer must know their needs and demands. Researches in the field of environmental psychology and architecture theories put emphasis on using Abraham Maslow's model (known as the pyramid of human needs) in architectural design and urban design (Lang, 1987).

Table 1: Children needs in space according to Maslow's hierarchy of needs

Maslow's hierarchy of Needs	Needs in Space
Physiological	Compatibility, Adequate facilities, Convenience, Welfare, Health, Human scale
Safety	Surveillance, Hierarchy, Clarity, Access control
Love/Belonging	Sense of place, Social Relations, Identity, Attractive and Charming, Public and private spaces
Esteem	Territoriality, Proprietary feelings, Flexibility
Self-actualizing	Variety, Precipitation in Design

Our understanding and knowledge of children's awareness of and attitudes towards outdoor environments and environmental issues has been largely explored through environmental psychology and environment-behavior perspectives (Kuo & Andrea, 2004; Cohen & Wingerd, 1993; Taylor & Kuo, 2006).

The studies on environmental preferences of children were divided into "favorites of children in milieus" and "what they do not like and make them fear".

Studies indicate that place preference varies with gender and age of children (Hart, 1979; O'Brien *et al.*, 2000). Young children tend to prefer play areas and sites close to home while teens favor 'invisible areas' such as undeveloped waste places, vacant areas, and recreational or commercial facilities. Girls tend to prefer sites close to home and green areas while boys tend to favor rather remote settings. In addition, preference and behavior may vary with the context of the neighborhood, the sociophysical reality that determines what options are available and what restraints are given to children (Min & Lee, 2006).

Special places -the forts, dens, and hideouts of childhood- play an important role in development and place attachment (Chawla, 1992; Sobel, 2002). Special places are usually close to home and are interstitial, that is, they are spaces that exist between other areas with clearly designated functions (Hart, 1979; Sobel, 2002). For example, alleyways, hedge rows, and culverts can all be children's special places, along with vacant lots and neighborhood woods. Special places help children to develop their identities, test social relationships, engage in problem-solving, and become independent and environmentally competent (Ellis, 2004; Hart, 1979; Powell, 2007; Sobel, 2002). Place preference studies indicated that children valued natural settings the most (Chawla, 1992; Castonguay & Jutras, 2009). Children prefer natural outdoor settings for their wide potentials for motor and social play (Evans, 2006). Such natural environment also affords greater independence and mobility (Kytta, 2004). In natural environment the type of play accessible is also more complex (Kirkby, 1989). Although Children in their middle years often choose outdoor, natural places as their special places (Ellis, 2004), Min and Lee (2006) have found that formal play and sport settings are the most preferred spaces around homes.

Children value places that allow them to engage in liked activities, because play materials or other objects are available in the place, or because the place itself is suitable for liked activities (Korpela *et al.*, 2002; Loukaitou-Sideris, 2003; Min & Lee, 2006).

Children appreciate places that give them the opportunity to meet friends (Korpela *et al.*, 2002; Min & Lee, 2006). Housing areas are important potentials for social support in bringing up children. The common areas between houses are important features that facilitate social activities in neighborhoods. Urban research indicates that the decline of social life in housing estates is closely related to the design of communal outdoor spaces (Farida, 2013). Good neighbor relationships offer supportive social

Research Article

environment. Less support gained from poor neighbor relations in high rise housing contributes to disruption in children development process (Evans, 2006). The open spaces in a residential complex are important features that facilitate social activities in residential spaces. The spatial arrangement of apartment blocks has been found to reduce social interaction among residents and influence their activity patterns (Abu-Ghazzeh, 1999).

Children's open space must have a comfortable environment, free of distractions around, as availability of sitting places, garbage bins, and shady trees. Children need to perceive that their environment is safe and secure; in other words, residential open spaces should be secured from various disturbances (trafficking, crime, accident, etc) and not endanger the children. In the shadow of insecurity, satisfaction decreases and leads to the loss of vitality and freshness, and individual and social despair and depression are replaced.

In addition to continuous and specific care, children have four basic environmental needs and parents play a role in them. These needs include motion, comfort, competency, and control (Rui, 2000).

These four factors should be considered in designs to reach an optimistic result:

- **The Environments Encouraging Motion:** These environments provide facilities for exploring, searching and understanding an environment and they are considered as important factors for the formation of human personality and development of child intelligence. Therefore, planning and designing patterns of open spaces for residential complexes may have a direct impact on development and physical health of children. Children are interested in physical activities in open spaces and they enter urban open spaces with a collection of motional abilities. Therefore, suitable facilities should be used in a residential environment to improve their health. Creation of various motional situations for further improvement of these abilities lays the ground for the development of their fundamental skills.
- **Environments Providing Comfort for Children:** When children feel comfortable in physical environments, they are encouraged to explore the materials and occurrences around them. Environmental conditions have a direct relationship with the application of residential open spaces. Providing comfort of individuals through protecting against inappropriate conditions such as sunshine or wind flow and paying attention to the regional microclimate may be considered as a step toward providing a suitable environment for children.
- **Environments Developing Child's Competency:** Child's independence is another important factor in designing residential open spaces. The created environment may have a role in the experience of children in terms of having a positive feeling about them; this happens through creating environments for children to feel happy, welcomed, and well-supported. These environments provide equal opportunities for children to participate and teach them how to be aware of their rights and become sensitive to them.
- **Environments Encouraging the Sense of Control:** Parental control over children is an important matter; however, an environment should be designed in a way to achieve this objective while maintaining the sense of independence in children. Environmental design may minimize stress in an environment and satisfy psychological security. A clear image of an environment provides a child with the feeling of safety.

RESULTS AND DISCUSSION

Quality of residential open spaces, as a behavior setting, plays an important role in the satisfaction of children. Functional specifications of spaces may affect quantity and quality of attracting children for attending and interacting in these spaces.

Time satisfaction is implemented when an individual achieves a relative limit of physical and mental comfort and the environment satisfies his/her different needs. Therefore, it is necessary to pay attention to residential open spaces. Time satisfaction will not be implemented unless spaces are designed with respect to children's social and age characteristics and based on their interests, demands, current activities; and this will not happen until a consistent relationship is established between children's behavior and the space. Sense of satisfaction with a space establishes an efficient relationship between the space and an individual as an individual has a sense of belonging and tends more to attend and use the environment.

Research Article

The outdoor near home space function as important activity arena for children. These spaces usually minimized for economic purposes, are actually important ecological environments for children. Open spaces in residential complexes play a variety of roles through their different uses. Residential open spaces' role and function can be seen in four domains; social, education, recreation and education. According to the study, the design principles of residential spaces that can satisfy children's needs and in accordance with the literature, is effective in promoting the satisfaction and can be explained according to the below table:

Table 2: Variables of children's satisfaction of residential complex open space

Spatial characteristics	Attractiveness	Contact with nature
		Scenic beauty
		Location and dimensions of green spaces
		Using charming forms
		Form of space
	Cohesion	Location and dimensions of the playground
		Location and dimension of gathering spaces
		Walking paths
	Privacy	Hierarchy of space
		Privacy policy
Social characteristics	Social interaction	Meet and socialize with others
		Sense of belonging
Physical characteristics	Designing of mass and space	In accordance with the characteristics, needs and aspirations of children
Management characteristics	Safety and security	Safety and security of playground
		Safety and security of walking routs
		Safety and security of open spaces
		Surveillance

Following recommendations are made for improving the quality of a residential environment:

- Designing residential open spaces based on climatic features of cities and providing climatic comfort in these environments for users
- Paying attention to cultural, social, and native characteristics of a region to provide a sense of belonging and psychological security
- Paying attention to residential open spaces as one of the structural elements of designing residential complexes in a way that formation of texture and volume in designing residential spaces is performed based on open spaces. Allocation of the remaining spaces caused by separation of buildings to open spaces and children playgrounds should be avoided.
- Improving the quality of open spaces and designing details based on design criteria and physical and mental needs of children in accordance with their emotional and behavioral patterns
- Organizing routes, separating pedestrian and car routes, providing conditions for independent and easy movement, and providing options for children's motion
- Improving social security coefficient through space controllability and strengthening the role of social supervision and informal control as complementary of supervision and formal control
- Developing and equipping residential open spaces with an emphasis on the natural environment and natural potentials of a region

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Research Article

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Research Article

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