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Research Paper

Qualitative Components of Residential Building Façade Design Based on Behavioral Analysis of Children's Mental Images in Historical Fabrics

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ABSTRACT

In contemporary urban architecture, particularly within historical fabrics, the biological needs of children—as one of the most sensitive social groups—are often overlooked. This study addresses the existing research gap concerning the qualitative aspects of residential façades from the perspective of children's mental images. The main objective is to extract the visual components influencing façade design from the perspective of this age group and to explain their relationship with residential sustainability in historical contexts, thereby enhancing the vitality of these areas. By adopting a mixed qualitative–quantitative methodological approach, the research seeks to answer the question: What qualitative indicators define the design of a child-centered residential complex, with emphasis on their mental images of the façade? In the qualitative phase, drawings by 82 children aged 7 to 12 depicting their ideal façade (in the Dar al-Ziyafeh neighborhood of Isfahan) were analyzed using theoretical foundations and the opinions of behavioral specialists. In the quantitative phase, a questionnaire based on the patterns extracted from the drawings was evaluated by 97 expert architects. Statistical analyses conducted with SPSS and PLS identified two main groups of components: tangible and intangible. The results reveal that children's shared mental images can be utilized as guiding criteria in façade design. This approach not only contributes to creating child-friendly spaces but also directly supports the enhancement and continuity of habitation within valuable historical fabrics.

Keywords: Child, Historical Fabric, Residential Complex, Façade, Mental Images.

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1. INTRODUCTION

Understanding the quality of interaction between children, as one of the most sensitive age groups, and their living environments is of great importance. The façade of a building, as the architectural front and the first communicative surface between a child and the built environment, profoundly influences the formation of their sense of belonging to the home and, on a larger scale, to the residential neighborhood. The distinguishing feature and significance of this research lie in its specific focus on examining children's mental images of the ideal residential façade within the valuable context of historical fabrics—an area that, despite numerous studies on the relationship between children and architecture, has remained largely neglected. This study, through a case study in the Dar al-Ziyafeh neighborhood of Isfahan, seeks to extract children's shared mental patterns and analyze the qualitative indicators derived from them. The ultimate goal is to propose a practical framework for designing desirable façades that align with the needs of this age group. Moreover, explaining how these patterns align with the historical context can enhance the appeal of such areas to families and thereby ensure the sustainability and vitality of residential life. From this perspective, the fundamental question addressed in this research is: What qualitative indicators define the design of a child-friendly residential complex, based on a behavioral analysis of children's mental images of the façade from the viewpoint of specialists?

2. LITERATURE REVIEW

Research related to the topic can be divided into two domains. The first group of studies identifies attention to contextual architecture and the infill architecture approach as the most appropriate strategies for strengthening the relationship between humans and the environment and, consequently, increasing attachment to one's place of living. The infill architecture approach, whose origins trace back to nineteenth-century Europe, emerged as a solution for engaging with the physical context (Masoud and Beigzadeh Sharaki 2014). The primary goal of this approach, beyond merely filling a vacant space, is to enhance environmental qualities. Its key achievements include reinforcing identity and sense of place, improving the coherence and safety of urban spaces, and ultimately elevating residents' quality of life. This issue becomes especially sensitive in historical fabrics, as successful intervention requires establishing a constructive interaction between the past and the future. In other words, the design of a new building must, on the one hand, respect the historical identity of the context and, on the other, present an innovative, forward-looking perspective while avoiding the imposition of an incompatible modern structure (Habibi and Maleki 2011). In the study by Niaei and colleagues, four factors were identified as physical components influencing the design of infill buildings: site positioning (including placement, orientation, street edge, entrance location, and views), form and shape (including massing, the relationship of mass and space, style, surfaces, façade projections, roof characteristics and skyline, ornamentation, and the form of openings), scale and proportions (size, height, window-to-wall ratio, and rhythm), visual characteristics of materials (including color and texture) (Niaei, Daneshjoo, and Bemanian 2021).

The second group of studies emphasizes the significance of designing architectural form for children based on child psychology. The messages a child receives from the surrounding world play a crucial role in shaping their behavioral patterns. Given that childhood is the foundational period for shaping personality and fundamental abilities, architecture and spatial design play a vital role in this process. Establishing an intelligent connection between the child and their surrounding environment and responding to their essential needs are indispensable requirements for developing architectural spaces, as the child is not a passive observer but an influential user within society. The research background demonstrates that the most practical method used by researchers to extract criteria for child-appropriate architecture is the content analysis of children's mental images through the participatory tool of drawing. The purpose of involving children in the design process is to respect their citizenship rights, as they have the right to express opinions on matters that affect them; thus, designers must consult children about the features of the design product at the outset. In a study by Khodakhah Jeddi and colleagues, using a participatory method, 70 children aged 7 to 12 were asked to depict their ideal space for a children's hospital through drawings (Khodakhah Jeddi et al. 2022). Similarly, the study by Behnia and colleagues indicates that providing creative responses to architectural issues is an essential criterion for evaluating the quality of architectural works, particularly when the project user is a child. Accordingly, this research seeks to identify a tool for assessing a child participating in the architectural design process, enabling architects to enhance the quality of participatory outcomes. The results showed that children possess considerable potential to produce creative responses to architectural problems and that, in addition to drawing, they can also respond to architects through other participatory tools, such as children's games (Behnia 2022). Based on the conducted studies, the most critical indicators can be categorized into five groups, as presented in Table 1.

Table 1. Summary of Data extracted from the Literature Review

Research Topic	Researchers	Research Method	Goal	Results and Findings
Child-Friendly Architectural Spaces	Kashanijo, Harzandi, and Fath-ol-Amumi (2014)	Documentary and field study; analysis of children's drawings	Identifying the desirable criteria for urban public spaces for children	Safety, green space, clean air, and vitality are the most critical indicators, as reflected in the opinions of experts and children.
	Kiani and Esmailzadeh Kowaki (2012)	Examining data from children's drawings	Investigating the components of child-friendly architecture	64% of children emphasized the presence of trees, green space, and playgrounds, and demanded participation in the design process.
	Behnia et al. (2022)	Participatory play with children: Analysis with MAX QDA software	Investigating the role of children's creativity in the architectural design process	Children can present creative ideas, and their potential can be tapped through participatory tools such as drawing and play.
	Karbalai Hosseini Ghiasvand and Soheili (2014)	Content analysis of paintings from four elementary schools in Qazvin	Identifying factors affecting children's perception of the urban landscape	Form, visual perception, place identity, and general landscape are essential factors in children's environmental perception.
Child-Friendly Neighborhoods	Matini, Saeedi Rezvani, and Ahmadian (2014)	Questionnaire, interview, and graphic analysis	Developing physical-spatial criteria for child-friendly neighborhoods	Identity, presence, accessibility, permeability, legibility, and participation were introduced as key criteria.
Child-Friendly Playgrounds	Ebrahimi, Saeedi Rezvani, and Maani Manjili (2012)	Field analysis and evaluation in the two districts of Darwaze Lakan and Golsar in Rasht	Improving the quality of playgrounds through understanding needs	Children's needs should be considered in the design of playgrounds to create high-quality play opportunities.
	Najafi, Dobaran, and Noor Alishahi (2017)	Participatory method with children in Zanjan parks	Playground Quality Assessment	There is a significant relationship between identifying needs and improving playground quality, which effectively increases children's social presence.
Child-Friendly Green Space	Kamelnia and Hagir (2009)	Participatory methods (storytelling, jigsaw puzzles, and painting)	Achieving Child-Friendly Green Space Design Criteria	Children desire appropriate materials, optimal placement, landscaping, bicycle paths, linking green spaces and play, and separating child-adult spaces.
Child-Friendly Hospital Environment	Hojjat and Ibn Shahidi (2011)	Children's participation through painting and questionnaire analysis with Atlas. TI	Designing the hospital environment to suit the child's needs	Identifying everyday needs and developing design patterns to reduce anxiety and improve children's environmental experience
	Ghobadian et al. (2022)	Collaborative play and drawing; analysis with Atlas. TI	Reducing behavioral problems and anxiety in sick children	Principles of sustainable interior design include green landscapes, a sense of belonging, need-centered design, flexible furniture, and appropriate lighting, temperature, and humidity.

3. THEORETICAL FOUNDATIONS

3.1. Concept of Housing and Dwelling

The concept of maskan (housing) in Persian has deep roots in the meanings of "calm" and "stillness." Morphologically, this term is a locative noun in the maf`al pattern derived from the root sakana, directly denoting a place for settling and repose. In its technical application, maskan refers to the physical space of human life. This connection

between place and tranquility is clearly reflected in the definitions provided in Dehkhoda's Dictionary, where equivalents such as "a calm place," "abode," and "dwelling" are cited for it (Dehkhoda 1998). In his phenomenological analysis, Gaston Bachelard introduces the house as the primary vessel within which everyday life unfolds. The essence of daily life lies in its continuity, which provides humans with a familiar anchor of stability. Accordingly, Bachelard regards the house not merely as a physical location but as "the first birthplace"—a space that eternally embeds within us the hierarchical layers of lived experiences and memories of dwelling. He summarizes this existential precedence of the house over the world in the expression that humans, before being cast into the realm of existence, have found refuge in the "cradle of the house" (Ghalambardezfuly, Naghizadeh, and Majedi 2019). Beyond its lexical meaning, "dwelling" is a phenomenological process for "existential emplacement" and "identity formation." This process involves forming a meaningful bond between humans and a specific environment, leading to a profound sense of "place attachment." As Norberg-Schulz (2002) explains, human self-awareness and the consolidation of existence in the world are direct outcomes of this act of dwelling. In describing the identity-forming dimensions of space, "Hivar" (Quoted in Rapoport, 2005) presents a set of indicators contributing to the child's personality development, including: defining individual identity, interaction with others, a basis for resistance, a space for refuge and privacy, an arena for daily activities, a private territory, the material body and shelter, and finally, a context for forming social networks. It can also be stated that the meaning of home for residents is not merely a collection of spaces with predefined, standardized dimensions; rather, it lies in understanding the flow of life within these spaces and deriving rules for how this flow transforms. In practice, the spaces of a home adopt different physical necessities in accordance with the lives of its inhabitants (Bakhtiarymanesh et al. 2023). By integrating various perspectives, it can be concluded that dwelling, in its qualitative dimension, is a comprehensive concept encompassing a wide range of needs, preferences, and social relations, and it plays a vital role at all levels in establishing interaction between humans, the environment, and other individuals. The home simultaneously reflects individual identity and embodies collective convergence—constituting a meaningful dwelling that signifies a profound bond between humans and the world.

3.2. Relationship Between Sense of Place and the Façade

One of the most profound experiences arising from the interaction between humans and the environment is the "sense of place attachment." This concept is rooted in Heidegger's view of "place" as the realm where external relations and the existential authenticity of humans intersect. Based on this, a place is not merely a geographical location but a space intertwined with meaning for its inhabitants and a key element in their identity formation. The principal distinction between "place" and "space" lies in this characteristic: place, unlike space, is infused with human values and is inherently particularistic (Habibi 2008). The transformation of space into place occurs through the "sense of place"—a perceptual-emotional phenomenon that anchors individuals in an intrinsic relationship with their environment and shapes their place identity (Sajjadzadeh 2013). Sense of place emerges from the integration of a person's sensory inputs with the environmental, cultural, and social layers of meaning, which, through the revival of memories and lived experiences, ultimately elevates a shapeless space into a place rich with identity, sensory, and behavioral attributes for its users (Fallahat 2006). For this reason, the study by Mohammadi Irlou and colleagues identifies the "activity dimension of place attachment" and the "physical component of mental image" as the two most influential factors in creating citizens' sense of place attachment (Mohammadi Irlou, Rahimi, and Vaziri 2024).

Place attachment forms at two interconnected levels: the physical and the cognitive–social. At the first level, the physical elements of the environment—including form, scale, texture, and spatial relationships—provide the foundational conditions for social interactions and the initial grounds for attachment. At the second level, as Norberg-Schulz explains (Quoted in Pakzad, 2014), place attachment and participation reach completion when a person's individual mental image of the place, derived from lived experience, aligns with the collective mental image dominant in that environment. This harmony between individual and collective perceptions constitutes the core element of attachment—the feeling of "identification" with place. Since the urban façade and building elevations serve as an interface between interior and exterior spaces and play a critical role in shaping observers' perceptions (Ghorbanian, Behzadfar, and Shariatpour 2020), building façades significantly influence the sense of place attachment. Among façade components, the four elements of façade parts, form, size, and

materials have the most significant impact. Moreover, legibility, memory evocation, climatic comfort, and tranquility enhance the influence of natural elements embedded in façades on place attachment (Amjad et al. 2021). It should also be noted that by improving components such as unity, order, proportion, balance, ratio, scale, rhythm, harmony, continuity, and coherence, the aesthetic quality of urban façades can be enhanced (Esmaili, Charejoo, and Hoorijan 2020).

3.3. Quantitative and Qualitative Factors Influencing the Design of Child-Centered Spaces

Childhood—which in lexical definitions refers to the period before puberty (Matini, SaeidiRezvani, and Ahmadnia 2014)—has been the subject of extensive scientific research. Until the early 1990s, studies in this field were primarily dominated by psychological theories that focused on developmental processes and the child's transition from dependency to adolescence. Within this framework, stages of cognitive development are meticulously categorized. This path begins with the sensory-motor stage (from birth to two years), during which the first signs of intuitive and logical thinking emerge. After that, the stage of sensory activities follows, which itself is divided into two phases (ages two to seven and seven to eleven). Azimi (2008) further classifies the initial sub-period into three subordinate stages, including imaginative intelligence, perceptual formations, and detailed operations.

In the third stage of childhood, cognitive abilities undergo a remarkable leap. At this point, an organized and logical mental system takes shape, which includes the ability to perceive, integrate perception with memory, and engage in higher processes such as generating, evaluating, and associating thoughts. Intelligence during this period is defined as a combination of sensation, perception, memory, hypothesis formation, evaluation, logic, and reasoning. The fundamental components of perception that form this complex system include images, signs, concepts, and rules (Azimi 2008). Overall, child development is the product of a dynamic interaction between biological maturation and continuous engagement with the environment, through which various mental, psychological, and cognitive skills are acquired.

One of the fundamental characteristics of childhood is the strong influence of the environment on the child. Due to physical and psychological limitations, children exert less impact on their surroundings than adults and are instead highly dependent on environmental conditions. In this regard, Cheluwala (1991) reached essential conclusions in a review of studies on the impact of the home's physical environment on children. His research shows that characteristics such as complexity, diversity, and the absence of environmental constraints are directly related to a child's cognitive development. These findings highlight the importance of understanding the child's perception of the home's physical space, as this can help identify environmental factors that influence their development (Agha Latifi 2008).

Given the high sensitivity and deep susceptibility of children, and considering that the early years of life play a decisive role in establishing the foundations of personality and mental, physical, and social abilities, the need for a nurturing environment for them is undeniable. Children require the experience of living in a world designed specifically for them—spaces filled with vitality and visual beauty, away from the turbulence of the adult world. Such an environment must provide a foundation for expressing creativity and fostering their individual talents (Azemati et al. 2016).

In designing environments suitable for children, predicting diverse spatial types—including natural and open areas, adventure zones, hidden areas, and play-related structures—is essential (Rangian Tehrani and Mahdizadeh 2016, 178). In addition, in architectural design for children, the space must be safe. Safe architecture does not merely refer to reducing physical danger; instead, it involves organizing spaces that support the child's physical health and well-being. Furthermore, interdisciplinary collaboration and the integration of perspectives from psychologists and architects can create safe spaces for children, ensuring protective architectural environments that provide both emotional comfort and physical well-being (Jangid and Junghare 2024). The key design principles for the creation and use of children's residential spaces are presented in Table 2.

Table 2. Quantitative and Qualitative Variables Involved in the Design of Children's Residential Spaces

Principles of designing residential spaces			
Flexibility of Functions	Organizing Access to Space	Shape and Size of Spaces	Competence and Responsiveness of Spaces
Form	Comfort and Safety	Attractiveness	Scale
Variety	Clarity and Legibility	Use of Natural Elements	Green Space and Playground

(KarmiAzari and Asadzadeh 2016; KarimiAzari and Mirfarhadi 2017)

4. MENTAL IMAGERY

The term "engareh" (mental imagery), which in everyday discourse is used to mean a design, plan, or insight, carries a fundamental concept in the history of thought. Persian dictionaries such as Dehkhoda and Amid, by defining it as "imagination" or "hypothesis," refer to its mental and non-definitive nature. Beyond these lexical definitions, engareh has been conceptualized in two primary forms within philosophical and scientific traditions. First, from a Platonic and cognitive perspective, engareh is a "mental form" or a mental event that emerges through perception and experience and, as a product of information processing, refers to the real world (Hasani and Alipoor 2010). Second, in the sociology of science, Thomas Kuhn gives engareh—or "paradigm"—a structural meaning and defines it as a dominant intellectual framework comprising the shared ideas, methods, and values of a scientific community within a given historical period. Just as an individual's mental image of the environment influences their spatial behavior to some extent, the most effective role of such mental imagery is to enable a person to navigate through space in pursuit of their goals (Mohammadi Irlou, Rahimi, and Vaziri 2024).

In this study, "mental imagery" is defined as children's mental representations of the residential environment, particularly their perceptions of the building façade. This approach pursues two main objectives: first, understanding children's perceptions and ideals regarding housing; and second, extracting meaningful and influential patterns for the design process through their active participation.

4.1. Drawing: A Process of Child Participation in Design

Due to significant cognitive and perceptual differences between children and adults, establishing effective communication with them—as well as selecting appropriate methods to involve them in the design process—presents particular complexities and requires unique strategies.

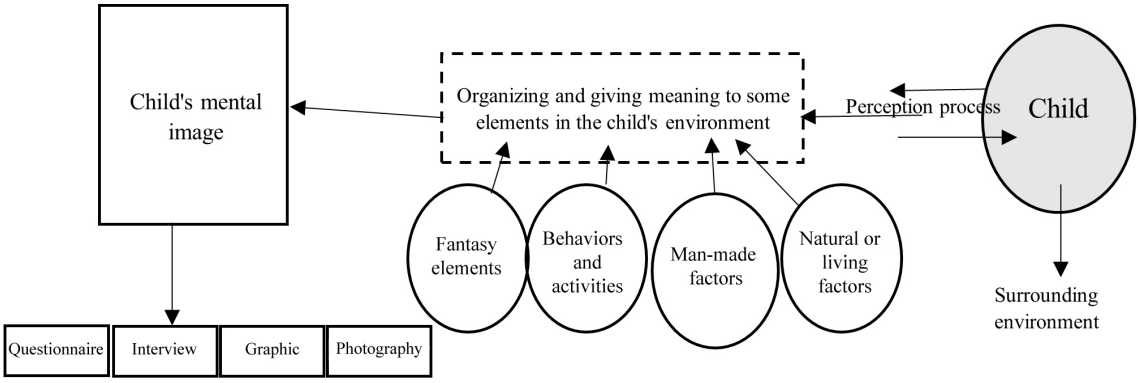

Fig. 1. Mechanism of creating Children's Mental Image of the Environment and the Approach used to Extract it (Asadpouer, Barzegar, and Keshavarz 2017)

The historical background of children's participation in the design of urban spaces dates back to the 1970s and the fundamental efforts of Kevin Lynch. In his "Growing Up in the City" project for UNICEF, he proposed the key hypothesis that children's real learning occurs in the dynamic, rich context of the city and society, rather than in the closed environment of the school. This approach doubles the importance of understanding the child's worldview. Therefore, given that images and drawings are rich sources of information for understanding people's social knowledge, the use of graphic arts is a valid and efficient methodology for fostering active participation and collaboration among children and adolescents in the field of design and planning. As Lynch and Banerjee (1977), for example, a study conducted by Sarraf et al. using graphical analysis of children's drawings showed that by analyzing and examining everything that goes on in the child's mind, a pleasant space can be created that is similar to the child's needs as the primary audience of the space; because children's drawings are one of the best sources for accessing the child's intellectual layers (Sarraf, Alborzi, and Amini 2023).

5. UNDERSTANDING THE STUDY CONTEXT

The Dar al-Ziyafeh neighborhood of Isfahan is part of the Jooybareh district and among the city's oldest. Historical evidence in the neighborhood, such as the minarets of Dar al-Ziyafeh and its proximity to the Jam Mosque, indicates the antiquity and value of this context (Fig. 2). Also, the frequency of the presence of children and adolescents in this neighborhood (132 children aged 7 to 12) and Its compliance with the research objectives, which are trying to strengthen the presence and continuity of life in the historical context

by linking the building facade with children's mental images, led to the selection of this neighborhood as the focus and subject of study.

Despite this rich background, the current state of the context, especially in housing and residential facades, is undesirable (Fig. 3). Combining research with these two critical factors, namely the antiquity of the context and the presence of children in the neighborhood on the one hand, and the lack of attention to facade design on the other, can achieve the research objectives and provide the grounds for sustainable residence in the historical context.

Fig. 2. Jameh Mosque of Isfahan; Attention to Surface and Façade Design Details

Fig. 3. Psychosis in the Façades of Residential buildings in the Dar al-Ziyafeh Neighborhood

6. RESEARCH METHOD

The present study was conducted using a mixed-method (quantitative and qualitative) approach with descriptive–analytical and applied objectives. The statistical population consisted of 132 children aged 7 to 12 residing in the Dar al-Ziyafeh neighborhood of Isfahan. Using Cochran's formula (with a margin of error of 0.07), a sample of 82 children was selected for the qualitative phase. In this stage, after receiving necessary verbal explanations regarding the historical fabric, the children were asked to draw their ideal residential façade. The initial analysis of these drawings—conducted based on theoretical foundations and expert opinions in child studies—formed the basis for developing a 27-item questionnaire. This questionnaire, structured on a five-point Likert scale to validate the extracted mental imagery components, was completed by 97 specialists. In the final step, qualitative data were analyzed using a conceptual approach, while quantitative data were analyzed using SPSS and PLS software. The results of these analyses were presented in tables and charts. Figure 4 presents examples of children's mental images of the facade, depicting the desired facade of a residential building.

Fig. 4. Mental Imagery of Residential Façades drawn by Children Aged 7 to 12

After examining the samples and identifying the content of each, and for deeper and more comprehensive analysis, the following steps were carried out:

1. Categorization of Concepts: In this stage, concepts extracted from children's drawings were categorized into two main groups based on their nature: "tangible components" and "intangible components," both of which are effective in the design process for children.

2. Analysis and Differentiation of Tangible Components: Through deeper analysis, eleven sub-components directly observable in the children's drawings were identified. These included physical and structural design elements such as "building form," "door and window form," "texture and materials," "street characteristics," "color," "scale," "level differences," "roof covering," and "view."

3. Extraction of Indicators from Each Tangible Sub-component: This step focused on analyzing the internal content of each tangible sub-component. By carefully examining the drawings, the patterns, repetitions, and variations found in each sub-component were identified and transformed into specific indicators or criteria. For example, in the sub-component "color," indicators such as "warm colors," "cool colors," or "absence of color" were extracted from the data.

4. Analysis and Differentiation of Intangible Components: Through further analysis of qualitative and conceptual aspects of the data, twelve intangible sub-components representing the social, functional, and perceptual dimensions of the environment from the children's perspective were identified. These included social and interactive concepts (such as participation, liveliness, and social identity), functional and spatial characteristics (such as mixed-use, accessibility, integration of open and closed spaces, and legibility), as well as dynamic and perceptual qualities (such as diversity, dynamism, attention to detail, and views inward and outward).

5. Identification of Concrete Instances for Intangible Concepts: In this stage, for each intangible sub-component, its manifestations and representations in the drawings were identified and categorized. For instance, for the sub-component "liveliness," elements such as "attractive forms" and "use of cheerful colors" were considered as indicators reflecting this concept. This process was repeated for all twelve sub-components. Finally, to achieve coherence and consistency in the analyses, all extracted data were systematically compiled and categorized in Table 3.

Table 3. Tangible and Intangible Components and the Sub-Components of Each Category

Main Category		Sub Branch	Code	Area
Tangible Components	1.	Building Form	Miscellaneous, Curved shapes, Non-geometric shapes, Geometric shapes (square and rectangular)	Architecture
	2.	Door Form	No door, Curved and arched shapes, Geometric shapes (square and rectangular)	
	3.	Window Form	No windows, miscellaneous, arched shapes, curved shapes (circles), triangular shapes, square and rectangular geometric shapes	
	4.	Texture	Curved and spiral lines, straight lines (horizontal, vertical, checkered, and triangular)	
	5.	Materials	Wood, stone, brick	
	6.	Passages	Crosswalk, railing, signpost, traffic lights, traffic, and driving lights	
	7.	Color	Colorless, cool spectrum, warm spectrum	
	8.	Scale	Disregard for scale, childlike	
	9.	Level Difference	Ramp, platform, stairs	
	10.	Roofing	Flat, use of the roof for a playground and green space, dome, slope	
	11.	Landscape	Urban furniture, natural elements	
Intangible Components	1.	Mixed Use	Commercial, supermarket, playground	Architecture
	2.	Participation	Drawing gathering spaces, drawing people in groups	
	3.	Activity	Attractive forms, using cheerful colors	
	4.	Social Identity	Encouraging presence in the place, paying attention to the child user	
	5.	Accessibility	Drawing paths leading to the entrance, paying attention to vehicle access, and paying attention to pedestrian access	
	.6	A Combination of Open and Closed Spaces	Combining open and closed spaces next to each other, paying attention to open space, paying attention to closed space	
	7.	Readability	Drawing elements separately, drawing basic shapes	
	8.	Attention to Detail	Drawing a face with details, drawing a car parking space, dividing windows, and drawing details such as door handles	
	9.	Variety	Drawing multiple details, drawing multiple forms	
	10.	Dynamics	Drawing multiple play equipment, flexible space	
	11.	Looking Out	Terraces overlooking the outdoors, windows looking out to the outdoors	
	12.	Looking In	Open and half-open doors, drawing the house in through the windows	

7. FINDINGS

7.1. Explanation of Quantitative Findings

Descriptive statistics analysis showed that 56.7% of the participants were female and 43.3% were male. In terms of age, 36.1% were in the 30-year-old and younger group, and 35% were in the 40-year-old and older group. Based on the results in Table 4, the intangible component (mean 3.60) had a higher score compared to the tangible component (mean 3.38).

Table 4. Descriptive Indices (Standard Deviation and Mean) of Child-Friendly Design Components based on Children's Mental Images (Case study: Dar al-Ziafeh Neighborhood of Isfahan)

Factors	Mean	Standard Deviation
Tangible	3.38	0.29
Intangible	3.60	0.29

According to Table 5, among the items of the tangible component, the highest mean (4.85) belonged to "paying attention to the child's scale," and the lowest mean (2.36) belonged to "preferring regular quadrilateral forms over curved and non-geometric shapes."

Table 5. Frequency Distribution and Percentage of Responses to Questions related to the Tangible Component

	Items	Statistical Indicator	Completely Disagree	Disagree	No Opinion	I Agree.	Completely Agree	Average
1	Architectural configurations based on regular quadrilateral shapes offer greater compliance and desirability in child-friendly environments than free- or curved-form configurations.	Frequency Percentage	5 5.2	71 73.2	5 5.2	13 13.4	3 3.1	2.36
2	The use of quadrilateral geometric shapes, such as squares and rectangles, in the design of building doors provides greater compliance with and desirability for the criteria for child-friendly environments than arched or curved forms.	Frequency Percentage	8 8.2	50 51.5	21 21.6	15 15.5	3 3.1	2.53
3	The use of triangular and quadrilateral geometric shapes, such as triangles, squares, and rectangles, in the design of building windows provides greater compliance with the characteristics of child-friendly environments than arched or curved forms.	Frequency Percentage	11 11.3	48 49.5	11 11.3	27 27.8	0 0	2.55
4	The use of straight linear textures, such as vertical, horizontal, checkered, and triangular patterns, in the facade of a building provides higher compliance with and greater desirability of the criteria for designing child-friendly environments than curved textures.	Frequency Percentage	5 5.2	55 56.7	21 21.6	16 16.5	0 0	2.49
5	Integrating written and numerical elements into the structure of the building facade texture, as an efficient approach, enhances its appeal and aligns with the characteristics of child-friendly environments.	Frequency Percentage	0 0	16 16.5	26 26.8	50 51.5	5 5.2	3.45
6	Using brick as the primary material in the building facade enhances compliance with the criteria for desirable environments for children.	Frequency Percentage	6 6.2	11 11.3	36 37.1	40 41.2	4 4.1	3.25
7	Using wood as the primary material in the building facade design better aligns with the criteria for desirable environments for children.	Frequency Percentage	0 0	0 0	24 24.7	57 58.8	16 16.5	3.91
8	Using stone as the primary material in the building facade enhances compliance with the criteria for desirable environments for children.	Frequency Percentage	8 8.2	27 27.8	43 44.3	17 17.5	2 2.1	2.77
9	Paying attention to the quality of design and placement of urban furniture in streets is a key component of child-friendly environments.	Frequency Percentage	0 0	0 0	6 6.2	40 41.2	51 52.6	4.46
10	Using warm-spectrum colors in the design of the building facade, compared with cold-spectrum colors, provides greater compliance with the criteria for desirable environments for children.	Frequency Percentage	3 3.1	9 9.3	14 14.4	48 49.5	23 23.7	3.81
11	Considering a scale appropriate to children's physical dimensions and perceptual needs during the design stages is one of the characteristics of favorable environments for these children.	Frequency Percentage	0 0	0 0	0 0	14 14.4	83 85.6	4.85

	Items	Statistical Indicator	Completely Disagree	Disagree	No Opinion	I Agree.	Completely Agree	Average
12	Using a ramp instead of stairs for level differences of less than 1 meter increases compliance with the design criteria for favorable environments for children.	Frequency Percentage	0 0	8 8.2	16 16.5	15 15.5	58 59.8	4.26
13	Using roof coverings in a sloped or domed form, rather than flat roofs, better aligns with the characteristics of favorable environments for children.	Frequency Percentage	2 2.1	8 8.2	51 52.6	23 23.7	13 13.4	3.38
14	Allocating the roof of a building to uses such as playgrounds and green spaces better aligns with the characteristics of favorable environments for children.	Frequency Percentage	8 8.	31 32	15 15.5	23 23.7	20 20.6	3.16
15	The use of urban furniture and play equipment in landscape design that is appropriate for children, rather than focusing solely on natural elements such as vegetation or water, better aligns with the characteristics of desirable environments for this age group.	Frequency Percentage	5 5.2	23 23.7	11 11.3	47 48.5	11 11.3	3.37

Figure 5 shows the average scores for each tangible subcomponent.

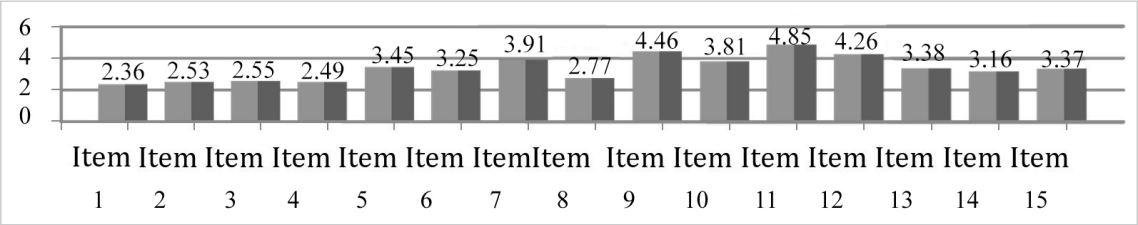

Fig. 5. Evaluation of Tangible Subcomponents based on Average Scores

The results of Table 6 show that in the intangible section, the highest (4.53) and lowest (2.81) average scores were assigned to items 21 (combination of open and closed space) and 16 (mix of uses), respectively.

Table 6. Frequency Distribution and Percentage of Responses to Questions related to the Intangible Component

	Items	Statistical Indicator	Very Little	Little	Moderate	High	Very High	Average
16	Creating diversity and mixing uses within residential complexes enhances compliance with the characteristics of desirable environments for children.	Frequency Percentage	9 9.3	27 27.8	37 38.1	21 21.6	3 3.1	2.81
17	Designing spaces with a gathering and participatory nature best aligns with the characteristics of desirable environments for children.	Frequency Percentage	0 0	0 0	6 6.2	43 44.3	48 49.5	4.43
18	In the process of designing child-centered spaces, using forms with visual and spatial appeal is more effective than simply using happy colors to increase children's vitality.	Frequency Percentage	3 3.1	32 33	30 30.9	23 23.7	9 9.3	3.03
19	Strengthening children's social identity by encouraging them to be present and actively participate in the space is more effective than simply treating the child as the primary user in the design.	Frequency Percentage	11 11.3	36 37.1	15 15.5	29 29.9	6 6.2	2.82
20	Designing special access for children by separating vehicle flow from pedestrian paths effectively improves permeability, strengthens spatial fluidity, and ensures environmental security.	Frequency Percentage	2 2.1	0 0	11 11.3	49 50.5	35 36.1	4.18
21	The purposeful integration of open and closed spaces in the design of environments for children effectively improves their physical, cognitive, and social performance.	Frequency Percentage	0 0	2 2.1	3 3.1	33 34	59 60.8	4.53

	Items	Statistical Indicator	Very Little	Little	Moderate	High	Very High	Average
22	To improve spatial legibility in design, the use of highly resolvable elements has a greater impact than the mere use of basic shapes.	Frequency Percentage	0 0	10 10.3	37 38.1	42 43.3	8 8.2	3.49
23	In the process of designing child-centered spaces, deep attention is more efficient than focusing solely on the design's generalities.	Frequency Percentage	2 2.1	27 27.8	21 21.6	30 30.9	17 17.5	3. 34
24	In child-centered design approaches, creating variety in form is more effective than focusing solely on detail variety.	Frequency Percentage	2 2.1	29 29.9	24 24.7	32 33	10 10.3	3.19
25	In the process of designing spaces appropriate for children, the use of playgrounds and play equipment has a greater impact on the environment's dynamics than flexible design.	Frequency Percentage	0 0	31 32	7 7.2	49 50.5	10 10.3	3.39
26	In the design of spaces for children, providing a view of the outside effectively improves the quality of interaction between the child and the space.	Frequency Percentage	0 0	3 3.1	15 15.5	51 52.6	28 28.9	4.07
27	In the design of spaces for children, anticipating the possibility of looking inward plays a key role in improving the perceptual experience and fostering peace of mind among child users.	Frequency Percentage	0 0	0 0	27 27.8	44 45.4	26 26.8	3.98

Figure 6 also shows the average scores for each intangible subcomponent.

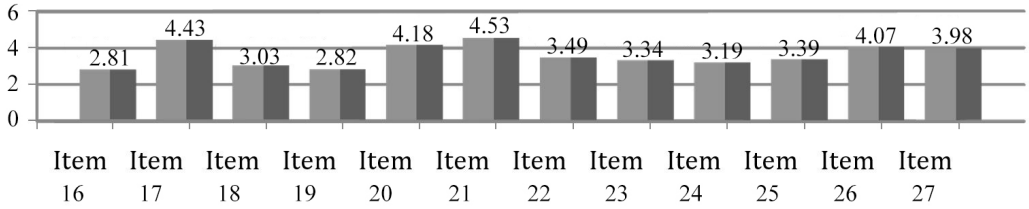

Fig. 6. Evaluation of Intangible Subcomponents based on Average Scores

7.2. Inferential Findings: Answer to the Main Research Question

In this section, to answer the main research question of identifying and evaluating the qualitative indicators of child-friendly residential complex design, a single-sample T-test was used. The results of data analysis in Table 7 show that the average total realization of these indicators in the study sample (Dar al-Ziyafeh neighborhood of Isfahan) is 3.49 (out of 5). From a statistical perspective, given that the calculated T value exceeds the critical T value in the table, it can be concluded that the level of realization of child-friendly design based on children's mental images is significantly above the average.

Table 7. Results of a Single-Sample T-Test to Measure the Level of Realization of Child-Friendly Design (Test Value = 3)

Component	Average	Standard Deviation	Deviation from the Mean	T	df	Sig. Level
Designing a Child-Friendly Residential Complex	3.49	0.20	0.021	23.323	96	0.001

- Findings in response to the second question: Evaluation of tangible components

To answer the second research question, which is to evaluate the level of realization of tangible components from the experts' perspective, a one-sample T-test was used. Based on the results of Table 8, the average realization of these components was evaluated as 3.38 (out of 5). Statistical analysis shows that this average is significantly above the average level because the calculated T value exceeds the critical value in the table. Therefore, it can be concluded that the tangible components of the design are in a favorable condition from the experts' perspective.

Table 8. Results of the One-Sample T-Test for Measuring Tangible Components (Test Value = 3)

Component	Average	Standard Deviation	Deviation from the Mean	T	df	Sig. Level
Tangible	3.38	0.29	0.030	12.604	96	0.001

- Findings in response to the third question: Evaluation of intangible components

To answer the third research question, which evaluates the level of realization of intangible components from the experts' perspective, a one-sample T-test was used. The results in Table 9 show that the average realization of these components is 3.60 (out of 5). Statistical analysis of this finding reveals that the aforementioned average is significantly above the average level (test value = 3), as the calculated T-value exceeds the critical value in the table. As a result, it can be concluded that the intangible components of the design are also evaluated favorably by experts.

Table 9. Results of the One-Sample T-Test for Measuring Intangible Components (Test Value = 3)

Component	Average	Standard Deviation	Deviation from the Mean	T	df	Sig. Level
Intangible	3.60	0.29	0.030	19. 708	96	0.001

7.3. Confirmatory Factor Analysis of Questionnaires and Processing of Measurement Models

In the structural equation modeling approach based on the "PLS" method, two main parts are evaluated. First, the external model or measurement model, which is equivalent to the measurement model in covariance-based approaches, and second, the internal model or structural model, which is comparable to the structural model in those approaches (Hooman 2016). Similarly, the model evaluation begins in the first stage by assessing the validity and reliability of the measurement model. In the second step, the structural model is examined by estimating the path coefficients and calculating fit indices. In the evaluation of the first part, namely the fit of the measurement model, three key indices are used: reliability of the index, convergent validity, and divergent validity. The reliability of the indicators is also measured based on three criteria: (1) Cronbach's alpha, (2) composite reliability, and (3) factor loading coefficients (Davari and Rezazadeh 2014).

7.4. Factor Loading Coefficients

In the framework of measuring the quality of measurement models, the first level of evaluation is dedicated to the one-dimensionalization of the indicators. This principle states that each indicator in the set of indicators should be loaded with a significant factor loading value onto only one latent variable, so that its factor loading exceeds the critical limit of 0.60. Factor loading values lower than 0.30 indicate the absence of significant loading, and the indicators in question are removed from the measurement matrix. This refinement is usually done manually (Davari and Rezazadeh 2014).

Table 10. Factor Loading Coefficients

Variable	Item	Factorial Load	Variable	Item	Factorial Load	Variable	Item	Factorial Load	Variable	Item	Factorial Load	Variable	Item	Factorial Load
Tangible	1	0.873	Tangible	7	0.934	Tangible	13	0.929	Intangible	19	0.768	Intangible	25	0.776
Tangible	2	0.873	Tangible	8	0.916	Tangible	14	0.812	Intangible	20	0.861	Intangible	26	0.819
Tangible	3	0.865	Tangible	9	0.870	Tangible	15	0.883	Intangible	21	0.780	Intangible	27	0.837
Tangible	4	0.874	Tangible	10	0.920	Intangible	16	0.794	Intangible	22	0.860			
Tangible	5	0.931	Tangible	11	0.853	Intangible	17	0.849	Intangible	23	0.750			
Tangible	6	0.898	Tangible	12	0.856	Tangible	18	0.704	Intangible	24	0.790			

As shown in Table 10, the factor loadings exceed 0.7, indicating acceptable reliability for the measurement model.

- Cronbach's alpha coefficient value

Among the important indicators for assessing the model's reliability is internal consistency reliability, which ranges from 0 to 1. Based on Cronbach's (1951) approach, values of 0.70 or higher indicate favorable internal consistency among indicators, and values below 0.30 indicate weak internal consistency and require revision or removal of related items. During testing the external model, aspects related to reliability, validity types, and measurement tools are systematically evaluated to confirm the conceptual adequacy and the accuracy of the measurement instruments.

- Composite reliability

Although Cronbach's alpha is a classic indicator of reliability, the PLS approach uses a more modern criterion, composite reliability. This index, first introduced by Wertz et al. (1974), has a significant advantage over Cronbach's alpha because it estimates reliability based on item correlations rather than absolute values. In evaluating PLS-based models, both Cronbach's alpha and composite reliability are calculated simultaneously to achieve a more comprehensive measure. Some researchers use the symbol CR for this measure. According to the accepted rule, values above 0.70 indicate favorable internal consistency, while values below 0.30 indicate poor reliability of the measurement model (Davari and Rezazadeh 2014).

$$= \frac{\left[\left(\text{Factor load index } 1\right)^2 + \cdots\ldots + \left(\text{Factor load index } n\right)^2\right]}{\left[\left(\text{Factor load index } 1\right)^2 + \cdots\ldots + \left(\text{Factor load index } n\right)^2\right] + \left[(\text{Factor load index } 1 - 1)2 + \cdots\ldots + (\text{Factor load index } 1 - n)2\right.}$$

- Convergent validity

Fornell and Locker (1981) proposed the Average Variance Extracted (AVE) index as a criterion for assessing convergent validity. According to their theoretical framework, the critical threshold for this index is 0.50; that is, values above this threshold indicate confirmation of the constructs' convergent validity. The AVE for each research variable is calculated using the following equation (Davari and Rezazadeh 2014).

$$\text{AVE} = \frac{\left(1\text{Factor load index}\right)^2 + \cdots + \left(n\,\text{Factor load index}\right)^2]}{n}$$

After estimating the AVEs for the research variables, the data on convergent validity were recorded and reported in Table 11. Considering that all the calculated values are above the threshold of 0.50, it can be concluded that the convergent validity of the constructs has been confirmed at the desired level. Also, as shown in Figure 7, all factor loadings exceed 0.70, indicating that the measurement model has acceptable reliability.

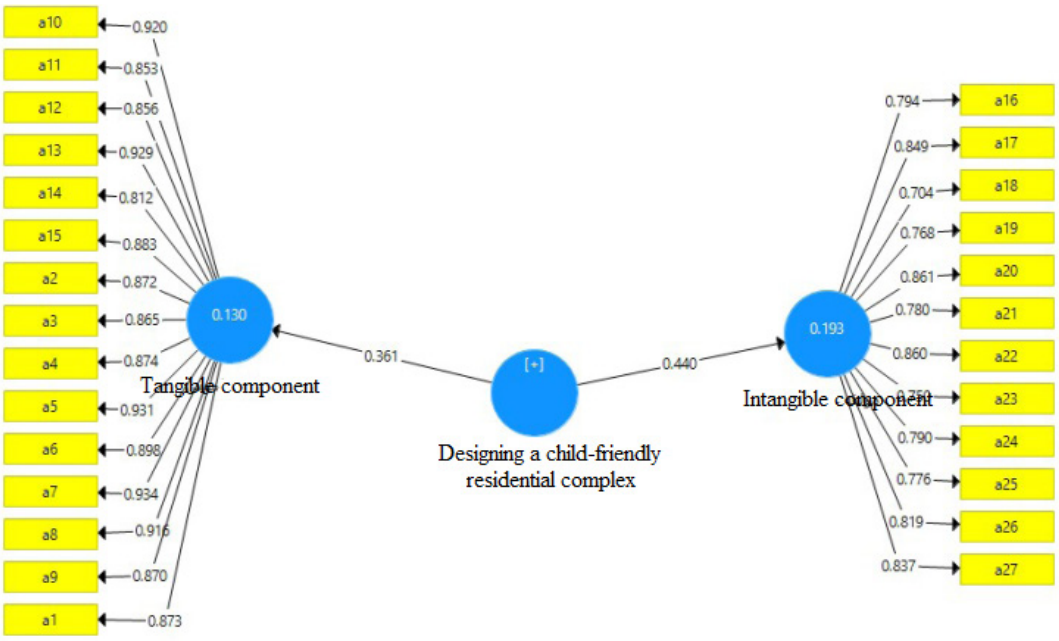

Fig. 7. Factor Loading Coefficients of the Confirmatory Factor Analysis Model

Based on the data in Table 11, the Cronbach's alpha and composite reliability values for all variables were above the accepted threshold of 0.70. In addition, the convergent validity index also showed all values above 0.50. These results generally indicate that the measurement model has acceptable reliability and validity.

Table 11. Results of the Reliability Test (Cronbach's Alpha Coefficient) for the Child-Friendly Design Questionnaire

	Cronbach's Alpha	Combined Reliability	Convergent Validity (AVE)
Tangible Components	0.981	0.982	0.786
Intangible Components	0.950	0.955	0.640

7.5. Divergent Validity using the Fornell and Larcker Criterion

Another essential criterion determined by divergent validity is the degree of relationship between a component and its indicators relative to that component's relationships with other components, so that acceptable divergent validity of a model indicates that a component interacts more with its indicators than with other components. Divergent validity is at a satisfactory level when the AVE rate for each component is greater than the shared variance between that component and other components (the square of the value of the correlation coefficients between the components) in the model. In PLS, this is checked through a matrix whose cells contain the correlation coefficients between the components and the square of each component's AVE. This model has acceptable divergent validity if the values on the main diagonal are greater than those below it. According to the values obtained in Table 12, it can be seen that the values of the AVE root on the main diagonal of the matrix are greater than the values under each cell, and therefore, the model has a relatively acceptable divergent validity.

Table 12. Results of the Fornell-Larker Criterion for the Child-Friendly Residential Complex Design Model

		1	2
2	Intangible Components	0.440	
3	Tangible Components	0.361	0.886

7.6. Structural Equation Modeling

To test the hypotheses of the present study, structural equation modeling with the partial least squares approach (PLS-SEM) and SmartPLS software were used. The choice of this approach was due to the complexity of the research's conceptual model. According to the standard analysis protocol in PLS, the model evaluation process is carried out in two consecutive steps: first, the evaluation of the external measurement model in order to examine the reliability and validity indices of the constructs and then, the evaluation of the internal structural model in order to test the hypotheses and analyze the relationships between the variables (Azar, Gholamzadeh, and Qanaviti 2012).

- External Model

In the PLS approach, the external model is first examined to assess the validity and reliability of the constructs based on their reflective or composite nature. If these indices are confirmed, the evaluation of the internal model begins (Azar, Gholamzadeh, and Qanaviti 2012).

The external model is actually equivalent to the measurement model in covariance-based approaches and specifies the relationship between latent variables and observed indicators.

- Internal model

Confirmation of the validity and reliability indicators in the external model enables evaluation of the internal model. The internal model, which is equivalent to the structural model in covariance-based approaches, expresses the relationships among the research's latent variables. Confirmed the data collection tool's validity, the next step is to analyze these relationships in light of the research hypotheses.

- GOF criterion

In this study, indices related to the model's validity were used to assess its validity. The validity of the commonality index assesses the quality of each block's measurement model. In contrast, the Stone-Geisser index (Q^2) with positive values indicates that the measurement and structural models are of acceptable quality. Although some PLS algorithms report common fit statistics such as the Bentler-Bonett normalized fit index, these indices are based on the assumption of minimizing the difference between the observed and reproduced covariance matrices; an assumption that is not valid in the PLS approach. The overall fit criterion in this method is calculated as the geometric mean of the mean values of commonality and redundancy. Based on this index, values of 0.10, 0.20, and 0.36 indicate weak, moderate, and vigorous model fit, respectively.

$$GOF = \sqrt{(Communality) \times (R\ Square)}$$

Table 13. Covariance and R^2 Values of the Effect of Child-Friendly Residential Complex Design among Experts

Variable	Shared Values	R^2
Intangible Components	0.410	0.193
Tangible Components	0.618	0.130

According to the table in Table 13, only endogenous variables have R^2 value. Based on the results of the GOF calculation, the value obtained for the confirmatory factor analysis model related to "child-friendly residential complex design" is 0.288. According to the proposed criteria, this value indicates an overall fit at a moderate to high level for the research's conceptual model.

$$\sqrt{0.514 \times 0.161} = 0.288$$

Figure 8 depicts the t-statistic values related to "child-friendly residential complex design" among architectural professionals.

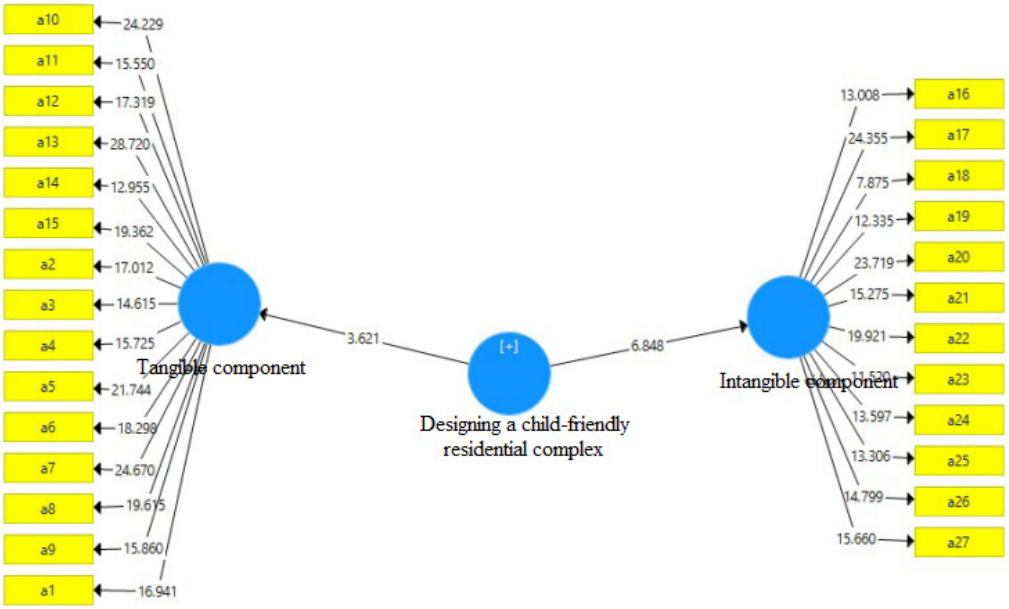

Fig. 8. Structural Model of the Research in the Mode of Path Coefficient Significance Test (t-Statistic Values)

8. CONCLUSION

The validation of the present study's findings with its background and theoretical foundations indicates alignment. The use of elements (as reflected in the opinions of Kashani Jo et al. 2014 and Kiani et al. 2012) is in line with the use of tangible components observed in the present study (such as building form and doors and windows). Achieving neighborhood design criteria such as accessibility, presence, identity, permeability, legibility, and participation (as reflected in the opinions of Matini et al. 2014 and Ebrahimi et al. 2012) aligns with the tangible components identified in the present study. In addition, the emphasis on the importance of the intangible dimension in Sajjadzadeh's (2013) perspective is consistent with the intangible component reflected in the findings of the present study, as well as the activity components of the sense of belonging to the place and the mental image reflected in the research of Mohammadi Irloo et al. (2024) and Ghorbanian et al. 2020; Mutlu Danaci and Kiran 2020; Amjad et al. 2021; Esmaili et al. 2020, with the impact of the tangible and intangible components listed in the present study, and confirms the accuracy of the findings and results of the study, and emphasizes the necessity of adapting facade design patterns based on children's mental images to create greater affinity between this age group and the historical context. Based on the question of this research: What are the qualitative indicators of designing a child-friendly residential complex based on the behavior of children's mental images of the facade, from the perspective of architectural experts? In the tangible component area, 11 components were identified, and in the intangible component area, 12 components were identified. The findings indicate that from the perspective of architectural experts, the highest average score (3.60) was assigned to the intangible component and the lowest average (3.38) to the tangible component; the highest average response score related to the tangible, with 4.83, is "considering the child's scale in design" and the highest average response score related to the intangible, with 4.53, is

"using open spaces and combining them with closed spaces". According to the results of Table 7, since the calculated t value is greater than the t value of the table, it can be concluded that the degree of realization of the design of a child-friendly residential complex based on the behaviorism of children's mental images of the facade is evaluated as above the average level. Also, the convergent validity is acceptable, and the measurement model has acceptable reliability. The calculation results showed that the GOF value for the confirmatory factor analysis model for "designing a child-friendly residential complex" falls within the desired range and indicates an appropriate overall model quality. Also, the use of soft, curved and low-angle forms and corners, the use of brick and wood as the primary materials, attention to street furniture, the use of warm colors, the combination of open, semi-open and closed spaces in multiple ways and the creation of controlled pause spaces, diversity in form to increase the child's curiosity and questioning power, attention to the scale of childishness and finally mastery of the environment with the aim of interaction and creating or promoting psychological security in the child are of particular importance. Table 14, in addition to introducing the extracted components and the adaptation of children's mental images of the facade to expert views, provides suggestions and solutions for designing a child-friendly facade across tangible and intangible components.

Table 14. Integrating Qualitative Findings (Children's Mental Images), Expert Evaluations, and Providing Design Solutions

Main Component	Subcomponent	Qualitative Findings (Child's Mental Image)	Expert Evaluation	Suggested Design Solution
Tangible Components	Building form	The frequency of quadrilaterals, curved forms, and non-geometric forms was observed.	The attractiveness of curved forms and soft lines for the child was confirmed.	Use basic shapes with soft and controlled corners, consistent with the historical context.
	Door form	The frequency of quadrilateral, curved, and arched forms was observed with little difference.	The attractiveness of curved and arched forms to children was confirmed.	Design doors in a curved, arched form, inspired by the historical context, while paying attention to the child's scale.
	Window form	The frequency of quadrilateral, curved, arched, and triangular forms was observed.	The attractiveness of curved and arched forms to children was confirmed.	Design windows in a curved and arched form, considering the historical context
	Texture	The frequency of checkered, curved, and spiral textures was observed.	The attractiveness of curved and spiral lines for the child was confirmed.	Use a combination of checkered texture (limited) and curved texture, consistent with the context.
	Materials	The frequency of brick, wood, and stone materials was observed.	The preference for wood materials, then brick, for the child was confirmed.	Dominant use of brick in combination with wood (limited), considering the historical context
	Passages	Attention to both pedestrian and vehicular crossings was observed in the paintings.	The need to pay attention to urban furniture for pedestrian and vehicular traffic was confirmed.	Integrated design of pedestrian and vehicular passages with appropriate urban furniture for both
	Color	The abundance of warm and cool colors was observed in order.	The preference for warm colors to create a child-friendly space was confirmed.	Predominant use of warm-spectrum colors in a controlled manner and in keeping with the historical context
	Scale	Attention to the child-centered scale was observed in most paintings.	The importance of paying attention to a child-centered scale was confirmed.	Adherence to the child-centered scale in the design of all spaces and elements
	Surface Difference	The frequency of stairs, platforms, and ramps was observed, respectively.	The preference for using a ramp and then stairs for the child was confirmed.	Priority on the use of ramps for short level differences and the use of safe stairs

Main Component	Subcomponent	Qualitative Findings (Child's Mental Image)	Expert Evaluation	Suggested Design Solution
Tangible Components	Roofing	The frequency of sloped, domed, and flat roof coverings was observed.	The importance of paying attention to the roof covering's form for the child was confirmed.	Use of sloping roof elements (if possible) to evoke a child's mental image of home
	Landscape	The simultaneous observation of natural and man-made landscape elements in the paintings	The importance of the man-made landscape for the child was confirmed.	Use of a combination of natural and man-made landscape elements to enrich the environment
Intangible Components	Mixed Use	The abundance of playgrounds, food stalls, and shops was observed, respectively.	The need for a mix of compatible uses near the residential environment was confirmed.	Placement of compatible uses (such as playgrounds) in the vicinity of residential areas
	Participation	Observing people and gathering spaces in the paintings	The need to design the space to enhance participation was confirmed.	Design diverse physical spaces to encourage participation and social interactions.
	Activity	Observing cheerful colors and attractive forms in the paintings	The positive effect of happy colors on a child's joy was confirmed.	Use cheerful colors and attractive formal elements while maintaining harmony with the historical context.
	Social Identity	Paying special attention to scale and the presence of children in the paintings	The importance of paying attention to the child as the primary user to strengthen identity was confirmed.	Involve the child in the environment through interactive design and assignment of symbolic responsibilities.
	Accessibility	Paying attention to both types of access by vehicle and on foot in the paintings	The need to separate pedestrian and vehicular access was confirmed.	Clear separation of vehicular and pedestrian access routes to increase safety
	A Combination of Open and Closed Spaces	Drawing open spaces alongside closed volumes in paintings	The importance of combining open and closed spaces for the child was confirmed.	Create spatial hierarchies (open, semi-open, and closed spaces) and controlled pause spaces.
	Readability	Observing basic shapes and drawing discrete elements in paintings	The need to separate elements to improve the environment's legibility was confirmed by the child.	Use simple, basic, and discrete design elements to increase environmental legibility.
	Attention to Detail	Paying attention to details such as doorknobs and window divisions in paintings	The importance of attention to detail for the child was confirmed.	Design architectural details (such as handles and textures) to engage the child's senses.
	Diversity	Observing variety in details and forms in paintings	The preference for variety in form was confirmed for the child.	Create variety in physical forms and design details to stimulate the child's curiosity.
	Dynamics	Observing multiple play equipment and flexible spaces in paintings	The need to create a playground to enhance dynamism was confirmed.	Design multiple play spaces and flexible physical spaces to enhance a sense of dynamism.
	Looking Out	Viewing terraces and windows overlooking the outside in paintings	The positive effect of "looking outward" on the child's interaction with space was confirmed.	Designing controlled openings (windows and terraces) facing the public space for the child's visual interaction.
	Looking In	Drawing the interior of the house from behind open doors and windows in paintings	The effect of "looking inward" on creating a bond and psychological security was confirmed.	Designing openings and spaces that allow for "looking inward" to enhance the sense of security.

The research shows that, despite recognizing the needs of children in facade design in historical contexts, paying attention to this age group's needs in the design process remains equally neglected. Based on the responses received and the analysis of experts' views, the influential factors are often common, and by combining the components, a more appropriate design for a child-friendly facade can be considered, and a basis for improving child-friendly urban and local spaces can be prepared. The results of this research can help experts in architecture and landscape architecture.

8.1. Future Research Horizons

The present research addressed the child age group and tried to present an accurate depiction of facade design in historical contexts based on their needs, and emphasized the importance of designing residential facades in historical contexts based on the needs and desires of children, which will increase the child's sense of belonging to the place and form the basis for sustainable residence in historical contexts. Future research can identify common areas and components by extending the age pyramid from children to adults, thereby achieving greater linkage in understanding needs and in designing housing facades in historical contexts.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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The authors commit to observe all the ethical principles of the publication of the scientific work based on the ethical principles of COPE. In case of any violation of the ethical principles, even after the publication of the article, they give the journal the right to delete the article and follow up on the matter.

PARTICIPATION PERCENTAGE

The authors state that they have directly participated in the stages of conducting research and writing the article.

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