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Evaluation of the Effect of the Relationship between Building Form and Street on the Human Behavioral Patterns in the Urban Physical Spaces; Case Study: Valiasr Street, Tehran*

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ABSTRACT

The current study evaluates the impact of the building form and street relationship on the human behavioral patterns in urban physical spaces. The relationship between the building form and the street is a significant factor in the connectivity of spaces and their quality. Understanding the relationship between the spaces and determining the valuation criteria of their quality by the citizens plays a significant role in their behavioral patterns. The research hypothesis claims that the perception and criteria of the relationship between the building form and street are different, and their effects on the human behavioral patterns might be different regarding the place and the space users. The current study examined two sequences of Valiasr Street in Tehran. The first sequence is from Valiasr Square to Valiasr Intersection, and the second sequence is from Rahahan square to Moulavi Intersection. The research method is an analytical descriptive. Also, using the survey method, the current study was conducted in the fuzzy logic framework. The research results indicate a variation in the relationship between the building form and street and human behavioral patterns. However, the criteria of the relationship between the building form and street in the urban physical spaces are different based on the extent and type of the citizens' behavior. Also, the impact of the relationship between the urban form and street in the behavioral patterns of the human is different based on the cultural differences among the citizens and the characteristics of the urban space of different sequences of the Valiasr Street of Tehran. The results also showed a significant relationship between the main form of the front space of the buildings and the sense of space ownership. Also, the form of the entrances strengthens the sense of belonging. However, the citizens with temporary activity and residence or those who only observe the space and pass it are not interested in the related behaviors.

Keywords: Human Behavioral Patterns, Physical Spaces, Valiasr Street of Tehran, Building Form.

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1. INTRODUCTION

In urban design, squares, streets, and buildings play a significant role in the public image of our cities (Moughtin, 2016). The meaning and role of these units in urban design, their arrangement and placement, and their details and designs have potential effects on human actions in space. According to Jane Jacobs, the nature of urban life lies in the vital diversity that must be available every time and for everyone and provide a wide range of options. The functional variety of the urban street can be evaluated in terms of the time of providing services and various groups of clients. The urban street must welcome collective activities and be a platform for individual activities. According to Jane Jacobs, creating visual attractions in the beginning and at the end of the street, terraces, setbacks, and other physical facilities, such as details in the bodies and flooring, and proper lighting at night, creating covered roofs as short pause points for the occurrence of the behavioral settings, the diversity, and mixture of the land uses are influential in the vitality of the urban streets. According to Cullen, creating various spatial sequences that take place gradually along the urban street path is influential in the vitality of streets. Anthropology followed by praxeology in urban spaces is among the significant matters regarding public spaces. Nowadays, isolation and reduction in social interactions are the most significant issues that threaten the urban residents' social life. Hence, people's need for places for social interactions and meet psychological needs has become one of the necessities of urban life. Considering that the public spaces in the cities and the main urban streets are the center of the most behavioral anomalies, and were unable to provide the proper contexts for organizing their audiences' needs and behavioral and normative patterns, designing an efficient approach to behavior management is among the most significant needs of the urban management and planning for these spaces. The urban streets are a part of the public spaces and have social efficiency, and most people use them for leisure time, recreation, and socializing with friends and social gatherings and alike. Therefore, it can be said that the streets are directly related to the patterns of usage and type of the users' behavior in this space and can be a place for the formation of social interactions and an area for organizing the behavioral patterns in addition to having the economic and communicative aspects. Based on the theorists' perspective on public spaces, as spaces for human interactions, the city is considered as a platform for human and their activities.

Behavioral patterns are among the social aspects of the urban spaces. The quality and occurrence of behavior are related to the quality of urban public spaces. In other words, the manner and extent of the citizens' behavior have an interaction with the criteria through which the citizens consider an urban public space desirable or high-quality. The current study claims that the behavioral patterns of humans, as social action, have an interaction with the relationship between building form and urban streets. Also, there is a variation between them. The extent of this interaction is different from a space to another, considering the nature, features, and type of space. The current paper aims to explain the interaction between these two variables and study their relationship based on the spaces' features. Accordingly, given the problematic nature of the subject, the relationship between citizens' behavioral patterns and the relationship between the building form and the urban streets was investigated. Considering the research subject, which is evaluating the effect of the relationship between form and building based on the human behavioral patterns in the urban streets, these two concepts will be explained in the following as the theoretical foundations.

1.1. Literature Review

Many studies have been conducted on improving the quality of the urban spaces that are the most significant place to occur the social interactions and are the origin of vitality and dynamicity of the cities, emphasizing the behavioral-environmental impacts inside and outside of Iran so far. It seems that before World War II, the research of behavioral science did not have a considerable impact on urban design, architecture, and relevant theories. In global experiences, prominent scholars considered investigating the mental-psychological effects of urban spaces on people's behavior and developed theories on behavioral-environmental impacts. Among these scholars are Kevin Lynch, Erving Goffman, Roger Barker, Altman Irwin, Amos Rapaport, William Hllly-Whyte, Jurgen Habermans, Romedi Passini, Moore & Altman & Holoil, Jan Gehl, and John Lang. Hossien Bahreini is also among the prominent Iranian scholars who focused on the behavioral-environmental impacts. In his book entitled "Analysis of Urban Spaces", he evaluated the behavioral patterns of the street users, which is the main urban form in his perspective, quantitatively and qualitatively. In a study entitled "Design and proposed behavioral patterns for the improvement of the urban parks", Behnaz Aminzadeh also studied the compatibility and flexibility of the behavioral place through the hierarchy of the human's needs. In another study conducted by Hansali Leghai et al., City Park in Sangelaj Neighborhood of Tehran was considered a case study to improve the ecological and social qualities. In this research, using the analytical-descriptive method in the data collection and analysis, all the physical, biological, social, cultural, and aesthetics layers were studied. Also, the studies on the behavioral patterns of the users of City Park were conducted to improve the ecological and social functions of the Park. According to the implemented analysis using the SWOT table, to solve the current problems, a proposed plan was presented to improve the City Park space to be used by all groups of people. Table 1 displays the key components stated by the scholars and theorists in this regard.

Table 1. Theorists Emphasizing the Behavioral-Environmental Effects

Theorist	Year	Theory	Key Components
Kevin Lynch	1960	City Image	Node, Edge, Landmark, Path, District, Five Elements That Make a City Image (Lynch, 2008)
Erving Goffman	1967	Study of Behavior in Public Space	Bringing Humans Closer Together and Strengthening Social Inclinations (Goffman, 1966)
Roger Barker	1968	Behavioral Setting	Continuous Activity, Environmental Domain, Structure of the Environment-Behavior Environment, Time Interval (Barker, 1968)
Irwin Altman	1930	Environment and Social Behavior	Privacy, Personal Space, Territory and Crowd (Altman, 2003)
Amos Rapaport	1977	The Human Aspects of the City Form	Non-Passive Human Position Versus Pedestrian Orientation Environment in Urban Environments Culture, Perception, Cognition, Behavioral Settings and Built Environment (Rapaport, 2005)
William White	1980	Social Life of Small Urban Spaces	Emphasis on the Social Role of Urban Spaces (Whyte, 2013)
Habermas	1980	Instrumental and Communicative Action	Human Relationship with the Environment (Habermas, 2005)
Romedi Passini	1984	Routing in Architecture	People's Orientation in Urban Space and Paying Attention to the Special Needs of Users (Passini, 1984)
Moore, Altman, & Holoil	1985	Evaluation of City Image	Investigating the Psychological Effects of Urban Spaces on People
Jan Grhl	2008	Living among Buildings	Three Groups of Activities in Urban Space (Necessary, Selective and Social) (Gehl, 1987)
John Lang	1987	Creation of Architectural Theory (Role of Behavioral Sciences in Environmental Design)	Man's Perception of Space, People's Perceptions of the Environment as A Kind of Mental Schema (Lang, 2009)
Hussein Bahraini	1996	Man's Perception of Space, People's Perceptions of the Environment as a Kind of Mental Schema	Presenting Proper Regulations with Qualitative and Quantitative Analysis of Street Space and Behavioral Patterns of Users, Especially Pedestrians (Bahrainy, 1996)
Behnaz Aminzadeh et al.	2002	Design and Proposed Behavioral Patterns for tThe Improvement of Urban Parks	Behavioral Adaptation and Flexibility Through the Study of the Hierarchy of Human Needs (Aminzadeh & Afshar, 2002)
Laghai et al.	2011	Reconstruction of City Park in Sangelaj Neighborhood with the Aim of Improving Ecological and Social Quality	Recognition of All Physical, Biological, Social, Cultural and Aesthetic Layers and Behavioral Patterns of Users (Laghai, Hasibi, & Fallah Farbod., 2011)

2. RESEARCH METHODOLOGY

The current research is descriptive-exploratory research in terms of purpose and is applied in terms of results. It is also fuzzy based on the qualitative-quantitative research process and methodology framework. According to the fuzzy methodology, it can be said that everything is valued relatively (Kosko, 2005), and the truth is between zero and one (Saie, 2013). The data collection method is the scientific documents and texts at the macro scale, and survey study using questionnaires and in-person interviews at the micro-scale. The observation method is to refer to the blocks connected to the selected sequences and interview with the space users (pedestrians, shopkeepers, and residents, and all the people present in the street). The selected sequences are based on cultural diversity and space land use along this long street, which is the basis for the behavioral patterns in the environment. The current study has been analyzed based on four units: 1. Tehran city, 2. Valiasr Street and two sequences, including from Valiasr square to Valiasr intersection and from Rahahan Square to Moulavi Intersection. 3. People, including shopkeepers and the residents in the studied sequences, and 4. Scientific texts and documents.

To achieve better results and due to the length of Valiasr Street of Tehran, this street was divided into sequences. Two sequences were selected based on the diversity of culture, land use, pedestrian traffic, and architectural elements. The selected sequences are as follows:

- First Sequence: from Valiasr Square to Valiasr Intersection.

- Second Sequence: from Rahahan Square to Moulavi Intersection.

The sampling method is purposive and is based on referring to 500 of space users in the selected sequences.

3. RESEARCH HYPOTHESIS

According to the theoretical foundations, the theoretical proposition of this paper is as follows: the relationship between building form and urban streets is a proper resource to improve the social interactions by regenerating the human behavior in the urban physical spaces. The research hypothesis is that there is a variation between the relationship of the building form and street with citizens' behavioral patterns in the urban physical spaces so that the stronger the relationship between building form and street, the more is the relationship between human behavior and the environment. The empirical studies were used to prove this hypothesis.

4. CONCEPTION DEFINITIONS OF VARIABLES

To test the hypothesis, the applied concepts must be defined operationally. In the following their practical indicators are presented.

4.1. Conceptual Definition of the Relationship between form and Building

Form dates back to the ancient times, when Plato (Ancient Greek philosopher) was the first one who explained Eidos in the philosophy (Zaferman, 2002, pp.13-21). Form have various semantic features that can be classified as follows:

1. Form is the perceivable character and identity of an object through which, the objects can be recognized and distinguished
2. Form is the system of structural relations and composition in a unified set and generally is considered organization of parts of a whole unit.
3. Form is similar to beauty in terms of origins.
4. Form is a general, open, and relative concept. As a result, it includes hierarchy and is variable based on the considered subject and assumed quality to recognize differences and similarities.
5. Form, although in unity with the subject and content when the object is active outside, is different from them.
6. Form can be separated from substance and transfer to the perceptual ability of human, consequently, has a subjective essence.
7. Form is the acting of an object and natural objection and essence of it.
8. Form has features in accordance with the human perceptual and mental capabilities.

According to the numerous applications of form, this word has different meanings in various fields and can be explained from a specific perspective in a specialized statement. However, what highlights this research is the building form. In architecture, creating space is the purpose of the artist (architect). Spaces include humans, and behaviors, events, and activities occur in space. Form transforms these spaces into an environment and gives body to them. The form is the body and face of the architecture. Design is a form to be able to have a concept and message and adapt its functional demands with its nature (Baker, 2007, p. 18). Building and architectural monuments will have a specific quality and features if having a proper formal relationship (the proper relationship between form and building). These features are reflected in the atmosphere ruling the space and its visual values. They result from population density, noise, type of traffic, homogeneity or heterogeneity of forms and activities, separation of the public and private realms, the proportion of the open space and green space to the closed and enclosed space, lightings, and other qualitative and quantitative alike (Hamidi, 1997, p.11). The operational definition of the current variable is presented in Table 2. The cities are among the complicated systems due to the number of elements and the complexity of the relationships. Finding the constituent components of this system and their links are the central core of the urban issues (Habib & Shokohi, 2012, p. 17). The nature of the relationship is the relative values like any other subject, and it is uncertain. Determining the relationship based on the two-value theoretical system of one and zero, which is common in the anthropological sciences and under the title of Aristotle's logic, leads to this proposition that a form is either related to the building or not. This proposition is not based on reality because the nature of the relationship between form and building, and the nature of all phenomena, in general, is not based on a two-value system, and it is multi-value, ambiguous, and graded or fuzzy in terms. Explaining a more accurate extent of this relationship's effect requires designing a multi-value system in which the answer of the propositions is not limited to yes or no and includes degrees of the relationships' effect, including a spectrum of the valued area between zero and one.

Table 2. Practical Indicators of the Building-From Relationship and Urban Streets

Dimensions of Building-Form Relationship and Street	Practical Introductions
Physical Relationship	Physical Legibility, Harmony, Order and Physical Beauty, Relationship in the Integrity of the Building and the Street
Spatial Relationship	Relationship in Views and Perspectives, Relationship of Accesses and Permeability, Proper Relationship of the Ground Floors of Buildings and the Street Space, Relationship of Entrances with the Street

Dimensions of Building-Form Relationship and Street	Practical Introductions
Activity-Social Relationship	Collective Spaces, Control of Interactions and Behaviors, Compatibility of Uses and Activities, Vitality, Safety and Security
Symbolic Relationship	Existence of Familiar and Memorable Symbols and Signs, Relationship of Symbols and Signs, Semantic Relationship
Connectivity and Integration of Qualities	Identification, Harmony of the Form of Space with One's Ideas and Thoughts, Sense of Belonging to Space after Leaving It.

4.2. Conceptual Definition of Human Behavioral Patterns

A behavioral pattern is a dominant behavior that occurs in a particular time and place to do activities for meeting the needs of a dominant group of users (Bahreini, 2015). The behavioral patterns result from the culture, beliefs, customs, living environment, society rules, and individual characteristics (Khatibi, 2013). A behavioral setting includes one or several integrated behaviors, which are the following features: the current behavioral pattern is limited in people's behavior (Dezhdar, Talischi, & Rohidehkeri, 2012, pp. 13-20). Place- behavior theory or behavioral setting is the most significant accomplishment of the ecological psychology developed by Rogers Barker. Barker investigates the physical parameters, a set of formal and informal rules, signs, space users, and their behaviors (Altman & Churchman, 1994). According to Rogers Barker's definition, a setting or behavioral place is a sustainable composition of activity and place, including the following components: 1. Returning and repetitive activity or the current behavior pattern, 2. A particular design of an environment or the physical environment, 3. The compatible relationship between these two structures, 4. The determined interval. In the next projects, one of Roger Barker's students, called Allan Wicker (1979), introduced two factors of the plan in the behavior setting, and the person or its controlling factors as the fifth and sixth elements (Land, 2009). In other words, when people enter a behavioral setting, they are influenced by the current synomorphy and adjust their behavior based thereon (Wen Liu, 2012). According to Scott, the behavioral setting is a basic unit for the environment that includes the physical and social elements of an environment as an independent whole and affect the people's behavior (Scott, 2005; Lang, 2009). For Lawson, the setting includes the space, people, and their activities. The culture in the legibility of the settings plays a significant role. He explains the behavior in a setting and the impact of the space on people's behaviors as the language of space the feature of which is being oral and controlling the proper behavior in the space (Lawson, 2001; Dehdar, Talischi, & RohiDahkeri: Quote: 2012, p. 14).

As the units of environment that person experiences them in their daily life and is placed in them by doing and repeating specific behaviors, the behavioral settings are the different situations that people are involved with them during their daily life and behave differently in each setting (Golrokh, 2012). A behavioral setting is a small social unit that results from the sustainable composition of activity and a place to meet the essential functions of that behavioral environment in a regular process (Matlabi, 2002). The behavioral setting is an objective unit that is not predefined by the researcher and is formed concerning the environment. According to Sanoff, a behavioral setting is an ecological unit in which behavioral and environmental sets are interdependent, and its visible behavior pattern is independent of the involved people (Sanoff, 1971; quote Dezhdar, Talischi, & Dezhdar, Talischi, & RohiDahkeri, 2012, p. 14).

Human activities design and codify particular behavioral patterns in the environment affected by the users' specific purposes. These behavioral patterns of human include the following conceptually:

A) Behavioral patterns in urban spaces: urban space is the place of the urban activities and the necessities related to that besides enjoying the social and cultural values of the society (Aydin & Ter, 2008; p. 190). According to Gehl (1987), people's activities in public spaces can be classified into three groups, each of which needs different features in the physical environment that are necessary activities, optional activities, ad social activities. In general, activities include three different ranges. The first group includes the essential activities that occur under any circumstances, and their occurrence is the least affected by the surrounding environment. Activities, such as going to school or work, shopping, and other public and daily activities are in this group. The second group of activities that occur in the urban space is the optional and selective activities that happen when there is a desire to do them, and the time and place provide the suitable conditions for them. Activities such as walking, sitting, and taking rest in attractive places are in this group. The third group is the social activities that include various range of interactions based on urban space features. The particular conditions of spaces for standing, sitting, eating, playing affect these activities. When the environment has a low quality, all the essential activities occur. However, in a high-quality environment, not only the essential activities are occurred but also, due to the better circumstances, the desire to spend more time for these activities increases (Gehl, 1987, pp. 9-14). Table 3 presents the relationship between the quality of the external space and the extent of outdoor activities occurrence.

Table 3. The Size of Activities in the Desirable and Undesirable Urban Spaces

Type of Activity	Undesirable Condition	Desirable Condition
Necessary Activities	●	●
Optional Activities	•	●
Social Activities	•	●

(Gehl, 1987)

B) Behavioral patterns in the environment: In urban design, human spatial behavior is a concept that describes the relationship between the built environment and the residents. A good spatial behavior indicates a successful urban design, while a bad spatial behavior can be an indicator of wasting resources and the cause of residents' dissatisfaction (Whyte, 2013, pp. 1-34). Since psychology plays a significant role in the human and environment interaction studies, it disagrees with the research investigating the environment and individuals, separately. Therefore, this science believes that to understand the environmental issues, one must pay attention to the dependency of the relationship (Ekici, 2004, p. 16). The environment is the container, and the human is the content. Humans show various behaviors in the environment, as the content in the space. These behaviors can be classified based on different approaches. Accordingly, two factors are influential in the type and manner of behavior: environment (the information that we acquire from that) and individual (with all his features). Practically, the basis of our behavior is the environmental features and individual characteristics simultaneously.

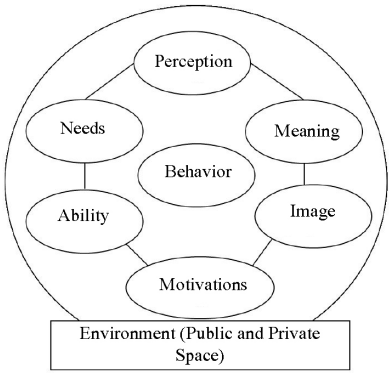

Fig. 1. Constituent Factors of Individual's Behavior in an Environment

Therefore, our behavior is the result of needs, motivations, abilities, environment, perception, and mental image, and finally, meaning that we build from the environment (Fig. 1). Therefore, it is evident that our activities can be formed differently affected by these factors (environmental and individual) (Pakzad, Jahanshah, & Bozorg, 2012, p. 292). Behavior is the product of the environment and interactions. Various physical factors, including noise, weather, and enclosed spaces, affect the human and its behaviors constantly. These movements and reactions are called behavior (Altman, 2003, p. 111). Physical factors (existed in the space) and non-physical factors (individual characteristics) are the significant factors in studying the definition of behavior. Therefore, the physical factors are achieved by studying the concept and theories of public space, and human factors can be achieved by studying the behavior theories and behavioral patterns. Thus, the behavior must be recognized to achieve the environmental and individual factors affecting the behavior.

5. TYPES OF BEHAVIOR IN ENVIRONMENT

Behaviors in the environment include:

5.1. Individual Behavior

Individual behaviors include behaviors that are done alone. The important fact about these behaviors is that these behaviors are done individually that might occur in privacy or public. In other words, one can have individual behaviors in public.

5.2. Social Behavior

Social behavior is a behavior that requires a relationship between two or several people. That is to say, it can occur with a minimum of two people; such as conversation, the group plays, and so on. This kind of behavior not only can be done by two or several people but also the individuals affect each other (Pakzad, Jahanshah, & Bozorg, 2012, p. 234).

5.3. Spatial Behavior

Spatial behavior includes the behaviors that occur in the place and affected by the surrounding environment. The behaviors between humans and the interaction between humans and the environment are considered in studying spatial behaviors. How we use our physical environment in establishing social relationships is the study area of human social behavior in relation to the physical environment (Whyte, 2013, pp. 1-35).

5.4. Non-spatial Behavior

Non-spatial behavior is the group of behaviors developed in the relationships between humans, and are studied disregarding the spatial aspect and the surrounding circumstances (Pakzad, Jahanshah, & Bozotg, 2012, p. 253).

6. THE RELATIONSHIP BETWEEN ENVIRONMENTAL QUALITY AND BEHAVIORAL PATTERNS

Different models have been used to study the environment and human behavior. Behavioral pattern considers human as a behavior-oriented creature. This actionist approach emphasizes environmental dependency as the determining factors of the behavior and tries to identify and consider them in the design. In the ecological pattern, behavior and environment are too intertwined that their separation is tricky. Behavior can be defined in the context of the environment. According to this approach, the environment is considered as the continuity of people's existence and personality. People are the cause of changes in the environment and are not merely affected by the environment (Khatibi, 2013, p. 67). This approach considers the relationship between humans and the environment self-dynamic and constantly changing. Based on this approach, the relationship between humans and the environment is established in various levels because the excessive emphasis on a level deprives an individual of a systematic quality of the environment-person relationship. This approach can link the designers' place-centered approach to the researcher's process-centered approach (Altman, 2003, p. 97). Behavioral patterns result from culture, beliefs, customs, living environment, society rules, and individual characteristics and each of these indicators justifies different behaviors of individuals along with other factors or alone. Different behavioral patterns need their specific environments for emergence or control. In the various urban environments, homogenous groups of people and individuals show different behaviors based on their purposes. According to Chapin and Brill, each person's activity in space is a function of the spatial patterns of his activity system. An activity system is the occurrence of the activity over a specific time to reach a specific purpose. In the activity system, every individual manifests the behavior as an episode in a place, that is so-called special. Accordingly, David Haviland developed Activity Space. As previously mentioned, Roger Barker introduced the behavioral setting. Barker explains the behavioral patterns related to the physical place of the same behavior. Through observing people's behavior outside of the laboratory and in the real environment of the city, Barker considers the behavioral settings from an artificial environment in a building to the city in addition to the aesthetics purposes to provide the behavioral environment of the stakeholders in the environment (activity space or behavioral setting. Based on Barker's theory, behavioral setting refers to a space in relation to two sets of elements: psychological elements and non-psychological elements. According to him, the psychological element refers to a specific form of a person's behavior. Non-psychological behavior includes material objects that facilitate the occurrence of specific behaviors. It has been seen that the possibility of the occurrence of a specific behavior in a specific behavioral setting is more than the possibility of the occurrence of other behavior. This behavioral possibility relates directly to our understanding of the place identity (Abbaszadegan, 2007). On the other hand, Barker states that a behavioral setting has two essential features that are structural and dynamic. In the structural feature, a behavioral setting includes one or several patterns of behavior and an environment and the surrounding environment, and the synomorphic relationship with the behavior. In the dynamic feature, the components of the behavior-environment of a setting considered synomorphs have a degree of dependency on each other, and this dependency is more than their dependency on the synomorphs of other behavioral settings. Then, he explains seven indicators of this definition: the current behavior pattern, the current behavior, and environment pattern, the environment surrounds the behavior pattern, the environment and behavior pattern have a synomorphic relationship, the components of the environment- behavior are called synomorphies. The synomorphs of a determined behavioral setting have a determined degree of dependency, and the synomorphs of a specific behavioral setting have more dependency than other parts of the behavioral settings (Barker, 1968). Environment, behavior, and their synomorphic relationship, as the most important part of the behavioral setting and consequently, the most important part of the built environment, are important both in studying the built environments both in terms of behavior and environment design with the behavioral approach. By studying various resources of the built environments with various approaches from anthropology to cultural and ethnic approaches, it is evident that considering the synomorphs and other components of the behavioral settings in design and with any approach is of importance. Therefore, despite the difference in satisfaction, Barker states that a behavioral setting enables a person to achieve satisfaction.

6.1. Fuzzy Scale of Concepts

Fuzzy degrees of concepts are determined based on the criteria of Table 4 by Ragin. According to the fuzzy values table, fuzzy logic was developed for each of the concepts presented in Table 5.

Table 4. Fuzzy Values

In Linguistic Terms	Grading
Full Membership	0.99
More Within the Collection	0.83
More Inside Out	0.67
Transition Point	0.50
More Outside to Inside the Collection	0.33
More Out of the Collection	0.17
Full Membership	0.01

(Ragin, 2008)

Table 5. Scaling of the Applied Concepts in the Hypothesis

Fuzzy Grading of the Relationship between Building Form and Street	**Complete Relation (0.99), More Related (0.83), More or Less Related (0.67), Intermediate (0.50), More or Less Irrelevant (0.33), Less Related (0.17), Completely Irrelevant (0.01).**
Fuzzy Grading of Related Behavioral Patterns	Completely Related to the Relationship between Building Form and Street (0.99), More Related to the Relationship between Building Form and Street (0.83), More or Less Related to the Relationship between Building Form and Street 0.67), Not Related to the Relationship between Building Form and Street and Not Unrelated to the Relationship between Building Form and Street (0.50), More or Less Lack of Relationship with the Relationship between Building Form and Street (0.33), Less Relationship with the Relationship between Building Form and Street (0.17), Completely Unrelated to the Relationship between the Building Form and The Street

7. DESCRIPTIVE ANALYSIS

The descriptive analysis was conducted in two aspects of contextual variables and dependent and independent variables. The items of the tensions were based on the dependent and independent variables according to Table 6. These items are explained based on the activities of the collective spaces introduced by Jan Gehl in his book entitled "Public Spaces and Public Life". Gehl explained the relationship between the public spaces and human activities based on four factors that include an analysis of the concrete physical conditions provided for the pedestrians.

- How are the public spaces formed?
- How much are the pedestrian and public life areas? And where are they located?
- What conditions must be considered for walking and leisure time in the city?
- What is the condition of commuting? What are the main contrasts in relation to the pedestrian movement? (Gehl, 2010, p. 2).

Table 6. Questioned Items in the Survey Study

Viewer Items of the Behavioral Record	**Viewer Items of the Relationship between Building form and Urban Streets**
Normally, as when walking, people's personal space is not invaded. Such as: not getting too close to the person.	- The overall shape of the space is easy to understand.
In this space, there is the ability to control one's dealings with others.	- The part of the street where the form of the buildings is connected to the street feels integrated. - The building and the street space are neat and tidy. - The street space along with the building feels like an integrated complex.
There is a connection between private spaces such as houses and semi-public spaces such as courtyards, semi-private spaces such as entrances or pre-entrances.	- The front buildings of the street are connective and integrated with the front buildings. - All existing elements such as buildings, plants, street floors, furniture and lighting are interconnected.
Indoor spaces (such as shops) are well connected to outdoor spaces (such as streets).	- Fill spaces such as buildings have a proper relationship with empty spaces. - During this part of the street, people always feel that they are surrounded by buildings like a fence. - The desired buildings and spaces can be easily found in this section

Viewer Items of the Behavioral Record	Viewer Items of the Relationship between Building form and Urban Streets
There is ample access to the street space from the buildings behind the street.	- This part of the street is felt as a part related to the rest of the street. - Signs and symbols appear as a set related to each other and integrated with other elements.
The entrances of the buildings are well connected with the street space.	- This space has a special identity and personality.
One tries to show with signs that the property in front of one's property is in one's possession.	- One can imagine the shape of the space and its elements in the mind, after leaving the space.

8. DESCRIBING CONTEXTUAL VARIABLES

The statistical results indicate that 300 respondents (68%) were male, and 141 (32%) were female. That is to say, out of the total questionnaires, 59 were not completed. The statistical results of the descriptive statistics of this variable show that based on the population with the age range of 19-75 years old, the average age of the respondents was 32.3, and the standard deviation was 9.82. According to the statistical distribution of this variable, 7 (1.5%) had primary school degree, 23 (5.2%) had middle school degree, 142 (32.1) had a diploma, 68 (15.4%) had an associate degree, 152 (34.4%) had bachelor's degree, and 39 (8.8%) had master's degree, and 10 (2.2%) had the Ph.D. degree. The respondents with master's degree have a maximum frequency of 34.4%. The statistical findings show that out of 441 respondents, 118 did not answer this question.

9. DESCRIPTIVE ANALYSIS OF THE RESEARCH HYPOTHESIS

Considering that the research logic is fuzzy, the independent fuzzy set (behavioral pattern) and dependent fuzzy set (building form-street relationship) were descriptively analyzed in two sequences. The behavioral patterns and the relationship between building form and street in the urban physical spaces were descriptively analyzed.

Empirical Data of the Behavioral Pattern: The empirical data of the behavioral patterns in the sequence of from Valiasr Square to Valiasr Intersection are as presented in Table 7.

According to the empirical data presented in Table, the relationship between the behavioral patterns in this sequence shows that most people have the behavioral pattern relationship rather than no relationship. 21.1% of the respondents were in the subset of intermediate, 18.2% of respondents were in the subset of more or less related, and 8.9 of the respondents were in the subset of complete relationship. These data show that most respondents considered the behavioral pattern relationship as" intermediate", and the census tendency was towards "agree". That is to say, space users consider their behaviors relatively associated with the relationship between building form and street.

Table 7. The Empirical Data of the Extent of the Relationship of the Behavioral Patterns to the Extent of the Relationship between Building Form and Street in the First Sequence

Dependency Items	Strongly Agree	Agree	Somewhat Agree	Intermediate	Somewhat Disagree	Disagree	Completely Disagree	Unanswered
Relationship Index (First Sequence)	8.9	13.7	18.2	21.1	12.3	11.6	6.3	8.8

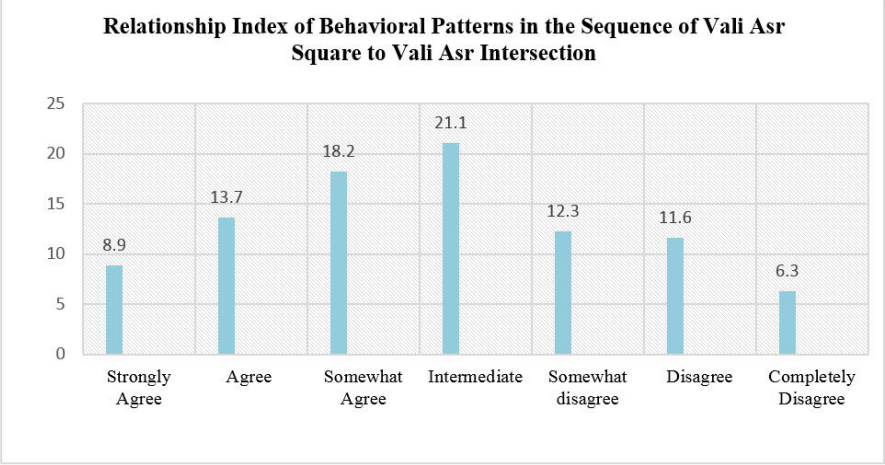

Fig. 2. The Relationship Index of the Behavioral Patterns in the Sequence of From Valiasr Square to Valiasr Intersection

The graph of the relationship index of the behavioral patterns in Figure 2 indicates that the transition point (intermediate subset), is the peak of the graph. This graph also shows that the percentage of people is more in the subset of "related" than "not related". The behavioral pattern index in this sequence displays that more people have related behavior. Based on the empirical data, 21.1% of the respondents were in the subset of "intermediate", 18.2% of the respondents have more or less related behaviors, 13.7% had more related behaviors, and 8.9% had completely related behaviors. The graph of the index of the behavioral pattern in this sequence shows that the transition point is the peak of the behavioral pattern relationship graph. The slope changes of the respondents on the two sides of the peak point are slightly different. On the completely related side, the slope is mild, and therefore, the respondents' percentage is towards the lack of relation. The behavioral patterns relationship in this sequence indicates that most of the citizens have related behaviors. In other words, most citizens show related behaviors regarding the relationship between building form and street and the interaction of the building, and their behavior is inevitable in the urban space. Also, at the level of the behavioral patterns' aspects and its constituent criteria, the criteria of controlling the encounters and interactions in the street space, showing the one's ownership in the front of the property, and providing a personal space are the most important behaviors related to the relationship between building form and street in the urban physical spaces. However, this behavior is variable depending on the form of buildings' entrances and their relationship with the street. Figure 3 shows the examples of the building entrances with different degrees of this behavior (1: relatively less, 2. Relatively much, 3. relatively very much).

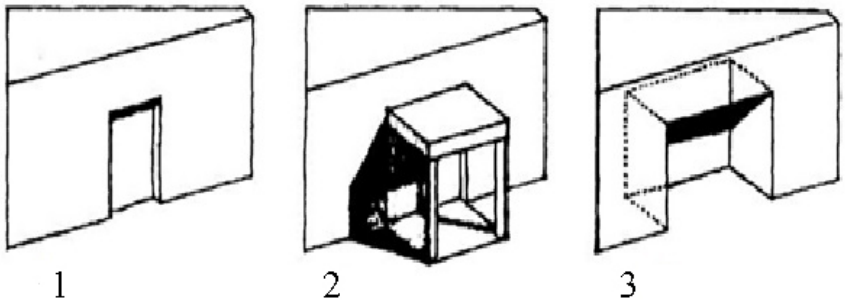

Fig. 3. Form of Entrances

Table 8. Pirical Data of the Degree of the Behavioral Patterns Relationship and the Building Form and Street Relationship in the Second Sequences

Dependency Items	Strongly Agree	Agree	Somewhat Agree	Intermediate	Somewhat Disagree	Disagree	Completely Disagree	Unanswered
Relationship Index (Second Sequence)	4.26	11.8	20	22.21	18.3	11.4	7.6	2.46

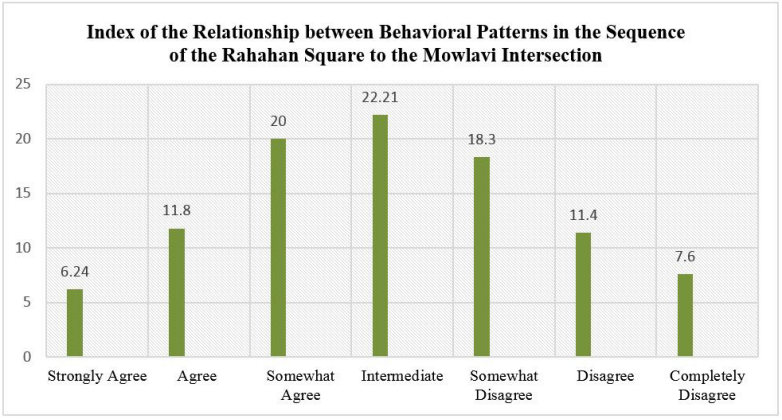

Fig. 4. The behavioral patterns relationship index in the sequence of from Rahahan Square to Moulavi Intersection

Figure 4 shows that the peak point is the peak of the curve. The change of the slope on two sides of the peak point is slightly similar. This similarity is more than the previous sequence, which has a mild slope on two sides of the peak point. According to the index of the behavioral pattern relationship, the citizens of the second sequence have the maximum percentage of the complete related behavior with a slight difference. Also, the citizens of the first sequence have a minimum percentage of the related behavior. In the subset of

the most related, the citizens of the first sequence are slightly more than the citizens of the second sequence. From the comparison diagram of the correlation index of Figure 4, it is clear that there is a relatively similar pattern in changing the percentage of respondents' membership in each of the subsets. The transition point or intermediate subset of both is the turning point of the graph. The lowest percentage of members in each end subset, i.e., the lack of relationship and the relationship and the highest turning point is related to the second sequence (Rahahan Square to Moulavi intersection) in the intermediate. In general, the relationship between the diagram slope in this sequence is more inclined towards non-related, and citizens in this sequence show less behavioral patterns related to the relationship between building form and street.

The various activities that people do in different parts of the street were surveyed to identify the behaviors and interactive effects of the building and behavior. Then, by classifying these activities into desirable and undesirable activities, the behavioral map was prepared for the studied space. It is noteworthy than the criterion for the classification of the activities in this part of the study is the space users' satisfaction with the activities formed related to the building form, which was based on their responses to the questionnaire and interview with the individuals in two phases selected from Valiasr Square of Tehran. Some of the most prominent activities were as follows: sitting in the spatial opening of the buildings or benches, creating pause space, eating and drinking, smoking, Street peddling, watching stores' windows, and alike. Moreover, the type of activity also includes the necessary activities, optional activities, and social activities. It can be understood that the degree of the quality of the environment can be recognized this way. These activities and behaviors can be seen throughout the street. Eventually, considering their impactability with the relationship of the building form and street, the obtained maps of the behavioral patterns were presented graphically (Figs. 5 & 6).

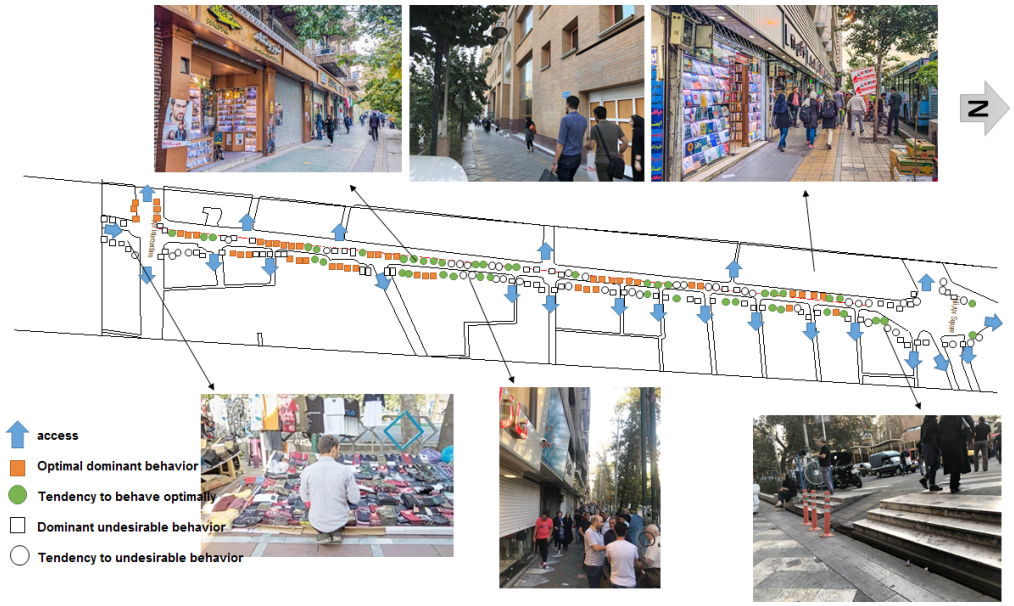

Fig. 5. The Map of Realms and Behavioral Patterns in the Sequence from Valiasr Square to Valiasr Intersection in Valiasr Street

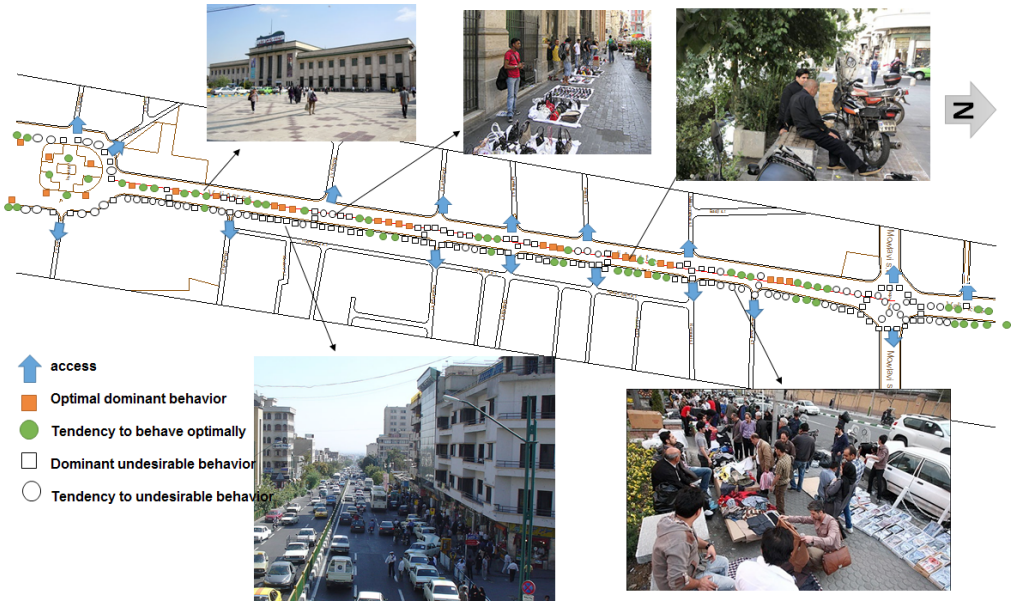

Fig. 6. The Map of Realms and Behavioral Patterns in the Sequence of Rahahan Square to Moulavi Intersection in Valiasr Street

Table 9. Empirical Data of the Degree of the Behavioral Relationships and the Relationship between Building Form and Street in the First Sequence

Dependency Items	Strongly Agree	Agree	Somewhat Agree	Intermediate	Somewhat Disagree	Disagree	Completely Disagree	Unanswered
Relationship Index (First Sequence)	8.9	13.7	18.2	21.1	12.3	11.6	6.3	8.8
Relationship Index (Second Sequence)	4.26	11.8	20	22.21	18.3	11.4	7.6	2.46

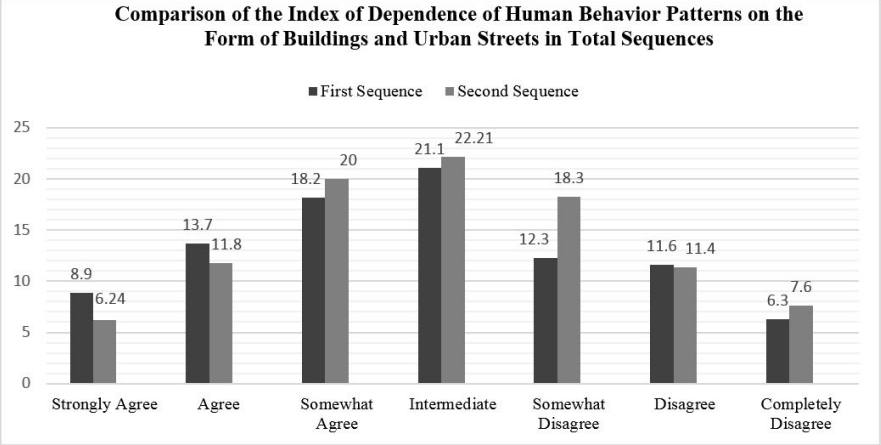

Fig. 7. Comparing the Dependency Index of the Human Behavioral Patterns on the Relationship between Building Form and Urban Street in the Total Sequences

10. EMPIRICAL DATA OF THE RELATIONSHIP BETWEEN BUILDING FORM AND STREET IN THE URBAN PHYSICAL SPACES

In the following, the evidence and empirical data of the relationship between building form and street in the urban physical spaces in two sequences of Valiasr Street are investigated. The index of the relationship between building form and street in the first sequence shows that most people of this sequence perceive the building form and public space of the streets as relatively related than unrelated. Similar to other variables, the turning point of the columns is the turning point of the graph. However, the percentage of the membership of the individuals is more towards the non-related than related. The index of the relationship in the sequence of Valiasr Square to Valiasr Intersection indicates that people who do not perceive the relationship between building form and street related are more than the percentage of the people who perceive the relationship between building form and street related. The distribution pattern of the percentage of the respondents in the subsets of the relationship between building form and street in the sequence of Valiasr square to Valiasr Intersection in Figure 5 shows that the people who perceive the relationship between building form and street related in this part of the street are less than those who perceive it non-related. The relationship index shows that in total, the people who perceive no relationship between the building form and street are 41.8% and more than those who perceive the relationship. However, the non-related proposition of the second sequence has a higher percentage of 21.18%. In general, the people who perceive no relationship are more than in the first sequence, i.e., 48.18%.

Table 10. The Index of the Relationship between Building Form and Street in the Urban Physical Spaces in the Sequence from Valiasr Street to Valiasr Intersection

Dependency Items	Strongly Agree	Agree	Somewhat Agree	Intermediate	Somewhat Disagree	Disagree	Completely Disagree	Unanswered
Index of the Relationship between Building Form and Street (First Sequence)	4.7	6.7	22.3	18.6	16.4	17.2	8.2	5.9

Table 11. The Index of the Relationship between Building Form and Street in the Urban Physical Spaces in the Sequence from Rahahan Square to Moulavi Intersection

Dependency Items	Strongly Agree	Agree	Somewhat Agree	Intermediate	Somewhat Disagree	Disagree	Completely Disagree	Unanswered
Index of the Relationship between Building Form and Street (Second Sequence)	6.12	10.8	12.42	17.3	21.18	18.7	8.3	5.18

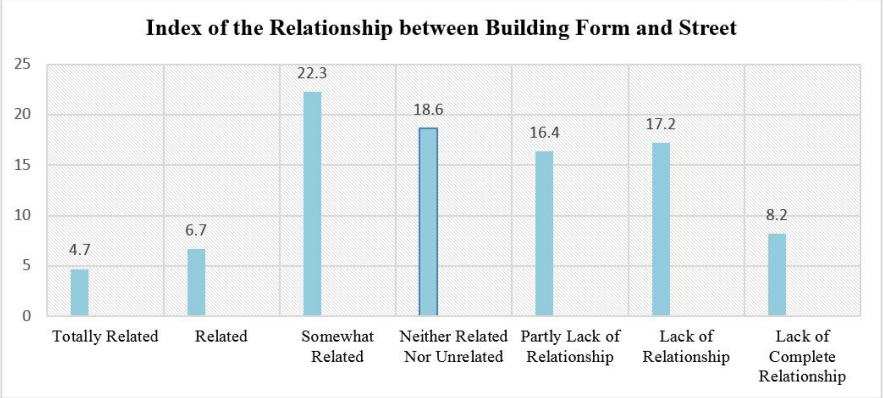

Fig. 8. The Index of the Relationship between Building Form and Street in the Sequence of Valiasr Square to Valiasr Intersection

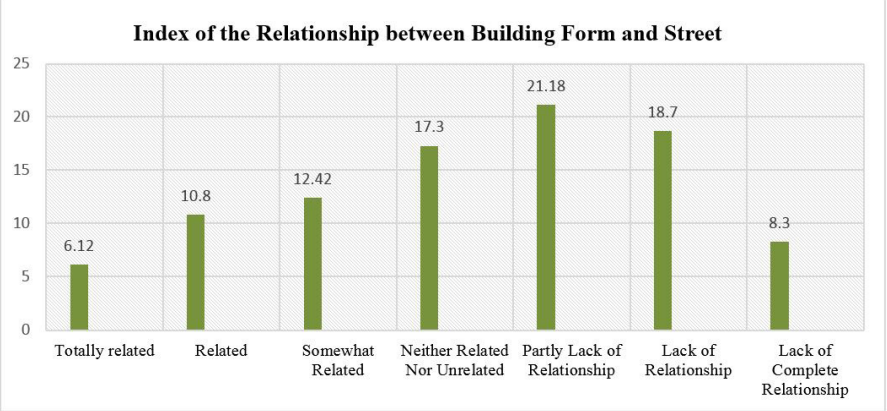

Fig. 9. The Index of the Relationship between Building Form and Street in the Sequence of Rahahan Square to Moulavi Intersection

The descriptive analysis of the dependent variable, i.e., building form and street in each sequences was conducted separately. In total, the sequences, or in other words, along most of Valiasr Street, are presented through the average of the experimental data obtained from the social survey in two scenes in Table 12.

A comparison of the index of the relationship between building form and street in different sequences is presented in Figure 7. The index of the relationship between building form and street in Valiasr street in different sequences shows that the peak point of the graph related to the first sequence of the subset of "somewhat related" is 22.3%. However, the maximum percentage in the index graph of the second sequence related to the somewhat unrelated is 21.18%. Moreover, the peak points of the graphs are not overlay and the percentage of the people who perceive not a complete relationship and lack of complete relationship is not the same. The distribution of the data on two sides of the peak points of graphs is different. Although the maximum percentage is allocated to the somewhat related in the first sequence, in a total of two sequences, most people do not perceive the building form and street related. In the first sequence, the data towards the lack of completely related to 41.8% are more than the data towards the completely related. Also, in the second sequence, the data of the completely unrelated of 41.18% are more than the data related to the completely related.

Table 12. The Index of the Building Form and Street Relationship in the Urban Physical Spaces in Total of the Selected Sequences

Dependency Items	Strongly Agree	Agree	Somewhat Agree	Intermediate	Somewhat Disagree	Disagree	Completely Disagree	Unanswered
Index of the Relationship Between Building Form qnd Street (First Sequence)	4.7	6.7	22.3	18.6	16.4	17.2	8.2	5.9
Index of the Relationship between Building Form and Street (Second Sequence)	6.12	10.8	12.42	17.3	21.18	18.7	8.3	5.18

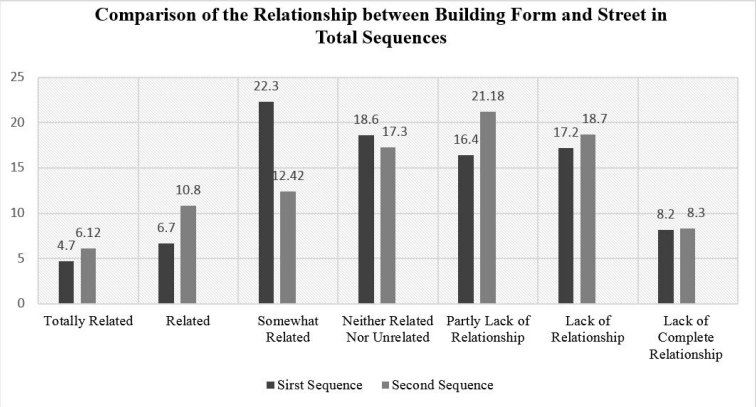

Fig. 10. Comparison of the Index of Building Form and Street Relationship in the Total of Sequences

11. CONCLUSION

The human behavioral patterns perceive the relationship between building form and street in the physical urban spaces differently. The perception of the building form and street relationship as one of the social aspects of the urban physical spaces has a considerable effect on the type of citizens'' behavioral patterns in the urban public spaces. The research shows that the building form and street relationship forms the urban physical space and is related to space perception and environmental action perception. Human shows visible behavior according to the environment. When the buildings as the architectural elements forming the street, have a formal relationship with the streets, they strengthen relationships with human behaviors. The evidence of the current study emphasizes the visual relationship at the extent of the height of the viewer's eye. Buildings and their formal relationship affect human perception at a certain height visible to the viewer (space user). The results of the present study showed that based on the cultural differences between citizens and features of the urban spaces, i.e., different sequences of Valiasr street of Tehran, the extent of the effect of the building form and street relationship and the human behavioral patterns is slightly different. There is a higher relationship in the sequence from Valiasr Square to Valiasr Intersection. Subsequently, the building form and street relationship are high, and the maximum statistical data of this sequence is related to the "somewhat related". The values of these data are slightly less in the sequence of Rahahan Square to Moulavi Intersection than the first sequence. The maximum impact of the building form and street relationship on increasing the relationship of the users' behavioral patterns in the public urban spaces is related to the first sequence of Valiasr square to Valiasr Intersection. This impact is slightly decreased in the second sequence of Rahahan Square to Moulavi Intersection. In the total of the sequences, the criteria of providing the personal space and possibility of controlling the encounters and interactions in the street space and showing the sense of ownership in front of the property have been affected significantly by the relationship between building form and street. This relationship is integrated with the wall of the main street. Also, the entrances of the building are usually designed to achieve this purpose. There is a considerable significant relationship between the sense of ownership in front of the property, constant controlling, the history of the residence, the constant attitude towards the residence, activity in that place, and sense of belonging to that place. This significant relationship significantly affects the main form of the building's entrances, and sometimes, the entrances' form strengthens the sense of belonging. However, the citizens who consider their residence temporarily or are just passing from this space and are the observer do not show a desire for the related behaviors.

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