Investigating Adaptive Behaviors in Urban Spaces in Relation to Dialectical Concepts of Isolation and Congestion

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Abstract

The presence of people in urban spaces and related components is one of the most important issues in the field of behavioral sciences in urban studies. The mechanism of static presence in urban spaces is influenced by factors that generally determine the quality of social life in these spaces. The present study examines the way people are present in urban spaces in relation to each other, and in this context, focuses on the concepts of "isolation" and "congestion" in these spaces. Studying and comparing behavioral patterns in these two thresholds, and studying its changes in the daily life sequence of urban spaces, to a large extent, clarifies the environmental preferences of space users, their behavioral actions and interactions, and the factors influencing their adaptive behaviors at peak times of "isolation" and "congestion" in public spaces. In this regard, the present paper examines this relationship through applied research based on field observations in Nabovat Square in Narmak, Tehran. The results include explaining the relationship between the environmental characteristics of urban space with the patterns of pause and presence in this space on the threshold of isolation and congestion. This study has shown that factors such as the presence of active uses, the availability of comfort facilities, the use of micro-spaces, and the placement of people in the context of creating favorable social interactions have raised the thresholds of "isolation" and "congestion" and delayed the desire to leave public spaces in these thresholds.

Keywords: Urban Spaces, Behavioral Patterns, Isolation, Congestion

1. Introduction

The quality of presence in urban spaces is affected by a multitude of factors, and these factors, such as multilateral forces, form a phenomenon called "Living in Urban Spaces" as a continuous set of events and the contexts in which they occur. The departure of the house for people means entering an area that removes them from the privacy of their own space and exposes them to favorable or undesirable social interactions. The actions and reactions of people in public spaces have long made researchers in the field of design and social studies interested to study the relationship between design and fundamental attitudes of human communication, and although the study of this relationship has so far been successful in product development, finding common ground between designing the environment and the social and motivational aspects of human interaction is of a lot of complications. Despite such ambiguities in public open spaces, addressing the study of the relationship between urban spaces as the context for the occurrence of events with behavioral patterns of individuals is one of the research needs in the field of behavioral sciences in urban studies.

In the context of studying the patterns of behavior in urban spaces, the times of "isolation" and "congestion" are important in terms of social interactions of individuals and communication with the environment. This is because when the urban spaces are close to isolation (undesirable) and congestion, the presence in the public space is no longer desirable, and people end up in the process of quitting the environment. Simmel (1950), Milgram (1970), and Stillitz (1970, 1969) have done research on the effects of congestion on people in urban environments, but these studies have a psychological aspect. Studies by William Whyte (1980, 1988), which have been carried out directly in urban spaces, have shown that a self-regulating flow controls the presence of people in public spaces under congestion so that if the conditions of the presence in space are undesirable, people will leave the environment themselves. This is the very stage Altman calls the "escape" stage. Altman (1975) describes the ideal area of social presence in relation to the times of isolation and congestion as illustrated below.

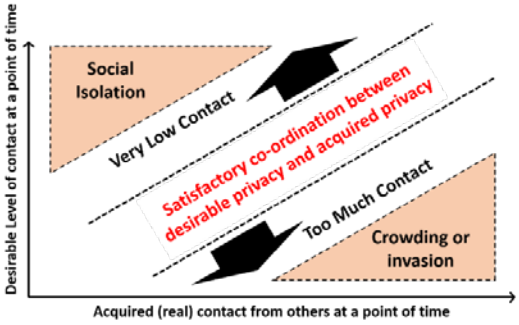

Fig. 1. Desirability and reality of social relation in isolation and congestion (Source: Altman, 2013)

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On the other hand, this process is largely influenced by the type of people's neighborhood and their social contacts. The distance defined by Hall (1966) and Schwartz (1968) defines the nature of these neighborhoods. The question is, what factors are involved in the mechanism of confronting the phenomena of isolation and congestion in urban spaces, and how these factorsaffect the process of behavioral change of people from the stage of voluntary presence in urban spaces to the stage of escape from these spaces? It seems that some environmental factors can change the time of people reaching the stage of isolation and congestion. In other words, the thresholds of isolation and congestion in urban spaces are influenced by these factors. Accordingly, the aim of this research in answering the above questions will be to identify these factors and their footprint in the study of adaptive behaviors and its changes in relation to the thresholds of isolation and congestion as dialectical concepts through studying the environmental preferences of users of a sample urban space and monitoring their behavioral patterns in their daily life scenario.

2. Research background and theoretical foundation

The environment and behavior are interrelated with each other. The relation between behavior and environment is a two-way process in which people and communities create and change environments, while they themselves are influenced by the environment in different ways (Carmona, 2003). Space without human events is an empty space. Space itself alone is the basis for the assertion of the place, and the place is a reality consisted of a variety of structures such as landscape, ecosystem, community, management, perception, function, and time the context of which is space (Behzadfar, 2016), and the relationship between environment and behavior also means when the concept of a place is crystallized. The history of research on the relationship between environment and behavior has coincided with the developments in the second half of the twentieth century. These developments were due to the need to pay attention to the category of understanding human in the humanities and in relation to its various needs. Many of these studies relate to "environmental psychology" as an interdisciplinary field of thought that is a bridge between humanities and psychology and the field of environmental design. Researchers who have studied the quality of urban spaces in the area discussed are classified into two categories. The first group belongs to the studies of the pre-half of the 20th Century, which, with a historical look, examined the physical and morphological characteristics of space, and their research did not relate to the behavioral aspects of individuals in space, and in the analysis of space properties for the study of efficiency and socialization of the public arena, the discussions remains intact. The second category of studies relates to the researches of the second half of the 20th century, when the mental and psychological needs of man along with his physical needs were important and the need for study of the interaction of behavior and environment among the researchers of psychology and behavioral sciences and among designers of the environment was felt. Since the present study deals with behavioral patterns in urban spaces, i.e. behavior and environment, this section refers only to the second category of these studies.

Between 1900 and 1950, public life studies were still not considered as an academic major. The first studies in this field took place between 1960 and 1980. In the 1990s, these studies were regarded as a strategic tool, and since 2000, these studies have become one of the main streams of urban studies (Golsavar, 2015).

Greenbie (1981) is one of the most researched scholars who has studied the relationship between social behavior and urban environments, and, along with the aesthetic attitude to urban spaces, has also addressed human action and response to urban spaces. Lenard and Lenard (1995) conducted extensive research in this field, and by comparing the presence of occupants and occupation of space in traditional and modern[1]examples of urban spaces, referred to the concept of "threshold experience" as a factor affecting the formation of a successful urban space (as part of a theater scene). Burden (1977) studies the relationship between static use and design characteristics in a small public space in New York (Green Acre Park), and has studied climatic factors and their impact. Bosselman(1984) has also conducted a study on the impact of climate comfort on the number and distribution of static space presence[2]. Francis (1987) considers the safety, security and comfort indicators in urban spaces and has an outlook beyond the physical and visual structure in public spaces. In addition, Im (1984) studying the aesthetic visual quality of urban spaces, Herzug (1992) studying variables for urban spatial preferences[3], Jordar and Neill(1978) studying nine public spaces in the United States, identified indicators as factors for improving the quality of urban spaces in relation to the maintenance of individuals in these spaces. Carr et al.(1995), as a result of their research, point to influential factors in the presence of people in public spaces, which are not merely related to the physical and aesthetic characteristics of these spaces and have psychological and behavioral aspects. Whyte (1980, 1988) is the first influential scholar to challenge the prior concepts that aesthetics or interior layout of public spaces is sufficient to ensure a high level of static space occupancy. These ideas expanded in the field of visual communication and urban permeability as a means to ensure the creation of usable spaces, when supported by Chidister (1988) and Cohn (1989). Whyte examined sixteen small public spaces in New York City and studied the impact of spatial dimensions of urban forms on the use of urban open spaces and concluded that there are varying degrees of importance among different factors. Gehl(1989) also explored patterns of space use in public spaces in Denmark's Storgut. In

addition to Whyte and Gehl, who presented important factors in the spatial morphology of the city in relation to the performance of public open spaces, Hillier et al.'s (1993a) study in connection with the theory of natural motion on the basis of the theoretical framework of space syntax (Hillier and Hanson, 1984) has somehow established a communication between the spatial morphology of the urban network and the functioning of public spaces and the presence of people in these spaces. On the other hand, while over five or six decades have not passed since the life of environmental psychology, researchers have turned to behavioral studies and environmental psychology during this short period, including Edward Hall(1966). In his book of "Hidden Dimension", Hall explores the how of understanding space through humans and has studied human adjacency with the environment around him in terms of psychology and perception. After him, Irvine Altman (1975) also studied concepts related to the psychology of the environment and tried to link these concepts with the man-made environment. Accordingly, the present study is based on Altman's views on the dialectical concepts of isolation and congestion and the range of desirability among them. On the other hand, the adaptive behaviors of individuals based on the Proxemics Proximity Theory of Edward, T, Hall is examined.

2.1. Concepts of "isolation" and "congestion" in urban space

"Isolation" and "congestion" are concepts directly related to the concept of "privacy." There are many definitions of privacy. Altman (1975), based on the ideas of behavioral thinkers such as Hall (1966) and Sommer (1969), considers personal space as a mechanism for monitoring interpersonal interaction and achieving the desired privacy. Altman refers to the two main definitions of "privacy": one is "acquired" and the other is "favorable." The acquired privacy is a privacy that the environment gives the person. But the desired privacy is a state that is ideal for a person. In fact, it is important for a person to freely determine the boundaries around him so that he eliminates them whenever it is necessary (Schwartz, 1968). Altman introduces "congestion" as a social status due to inefficiencies in the mechanism of privacy by investigating personal space in relation to personal, interpersonal and situational / spatial factors in behavioral research. If the acquired privacy is more than favorable one, it will lead the person to isolation, and if it is less than favorable, he will gradually be engaged in congestion. The congestion and its consequences, such as the excessive approach of others, especially the aliens, are perceived as threatening and often lead to escape, concern, and other reactions. So, the concept of privacy has a dialectical nature, gradually moving from two sides in a range of favorability to unfavorability.

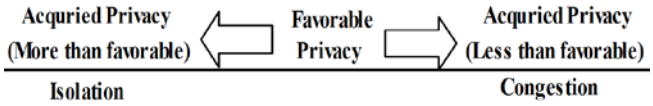


Fig. 2. Tavorable privacy, between Isolation and Congestion area

On the other hand, the concept of favorable privacy itself does not have a stable limit, and varies depending on the circumstances of individuals in different context (mental and psychological conditions, cultural issues, and time conditions). Acceptance or non-acceptance of others within the territory is subject to conditions, and the favorable perfection of privacy depends on time and conditions. Therefore, one can say that the relation of a person to others in a public space, while having a dialectical nature, can be regarded as favorable in the midst of isolation and congestion until it reaches the thresholds of these two.

2.2. Proxemics proximity

The behavior of individuals in urban spaces involves physical and emotional distances. Edward, T. Hall (1966), in relation to the social relations of individuals with each other, using the quadruple "flight," "critical," "personal," and "social" distances proposed by Heidegger (1955), presented the proxemics proximity model offers a privacy for humans that determines the extent of the relationship between the individuals in terms of emotion and perception. These distances, in addition to the physical abilities of human vision as the most important sense of communication in urban spaces (Gehl, 1987), are in some way related to the concepts of privacy, isolation and congestion in these spaces. As Whyte also points out, people will not use it if they cannot see the space (Whyte, 1980: 57). Accordingly, the study of the visual and communicational domains of man and its limits in relation to the study of the behavior of individuals at times of isolation and congestion is necessary. These domains can be presented in the following table.

Table. 1.the relationship between visual and communicational domains in relation to the concepts of isolation and congestion,Source: adapted from Gehl (1987) and Hall (1966)

	Domain of view		Social relationship	Communication area
Visual domain	Observing human	1600-3200 ft	Not establishing social relationship	Privacy
	Detecting the human body	325 ft		
	Social domain of view	0-325 ft	Social life (tendency to visit and be visited)	Favorable social relations
	Diagnosis of people's gender, their approximate age and what they do.	250-325 ft		
	Detect facial features and age	100 ft	Acquaintances know each other.	
	Detect the emotions and states of others	60-80 ft	Social meetings and visits emerge.	
	Strong sensory relationships	0-2 ft	Entrance of strangers make people to react.	Congestion
Communicational domain	Intimate distance	1.5-4.5 ft		
	Personal distance	0-1.5 ft		
	Social distance	4.5-12 ft	Individual and collective dialogues are formed.	Favorable social relations
	General distance	More than 12 ft		

On this basis, Hall's studies have shown that when strangers pass through a distance of approximately 1.3 meters, the stress begins and often cannot be sustained for a long time (Hall, 1966). Gehl also confirms these distances, pointing out that such a gap in public spaces exists only among people whose relationship closeness is to the extent that they interact with each other (Gehl, 1987). On the other hand, the distance of more than 100 meters in terms of domain of view is out of the social domain of vision. Although the human body is also recognizable outside this distance, the tendency to see and be seen almost does not happen beyond this distance. Particularly, there are generally other obstacles in the urban landscape as well.

In this way, social life is relatively active and movesin a distance of 1.5 to 30 meters between people in urban spaces, moving closer causing a sense of congestion. At a distance between 30 and 70 meters, people may be able to sit watching others, but beyond that distance, the person will feel isolated.

3. Research Method

Before choosing the method of research and application of the research tool, the researcher must know the subject and choose one of the paradigms of cognitive studies based on the dimensions of the subject. The "paradigm" or pattern is a set of general ideas and common accords among scientists about understanding and addressing issues (Kuhn, 1962). The present research is an applied research with post-positivist approach. In evaluating and analyzing data, qualitative and quantitative approaches have been used. This research studies the implications of isolation and congestion in relation to the implications of these concepts in the dimension of the behavioral patterns of utilization of urban spaces. Study indices have been studied in two categories of "patterns of pause " and "patterns of motion". The "patterns of pause" include the "distribution of stand-up and sitting activities" and "patterns of motion" includes reviews of the "distribution of population passing through the gateway" and "movement tendencies within the space" (Fig. 3).

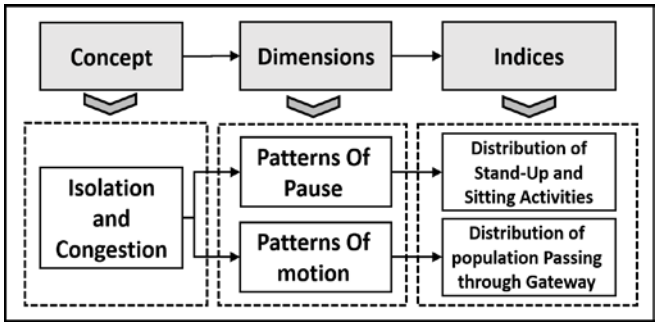


Fig. 3. Concepts, dimensions, and indices used in the study

In this research, collecting the required information on "patterns of pause and movement" and "people's tendencies" in urban space has been done through a survey using observation and questionnaires. "Counting", "behavioral mapping," "drawing motion," "pursuit," " tracking," and "shooting" are techniques that are used to observe space and

collect an important part of the data according to the subject matter of the research. In this regard, in addition to field observations of physical and functional elements, the target area has been monitored at certain times and the necessary information, including entry and exit data in space, and patterns of motion and pause, has been recorded. The method used to study the individual priorities in the behavioral patterns of urban space usage is also a questionnaire and a survey of users of space. The target community in this regard refers to theNabovat Square ofNarmakspace, whose statistical sample includes a variety range of individuals (Fig.4).

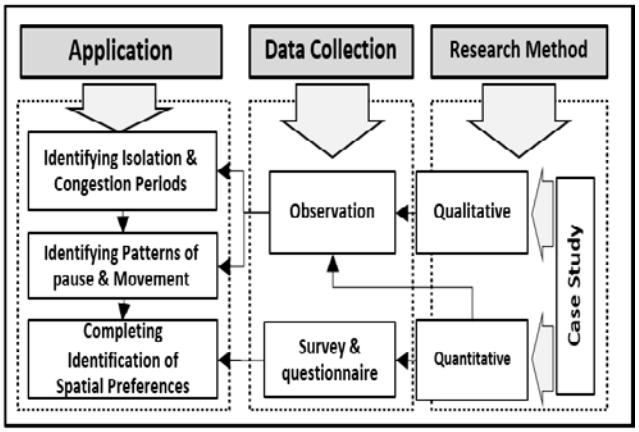


Fig. 4. Research method in a case study

The sample size is calculated based on the total traffic volume in the Square space using the Cochran estimation technique (1977). Accordingly, by taking the number .5 for p and q and taking into account the 95% confidence factor, the sample size is 379. Accordingly, 380 questionnaires are distributed in the area. Among the methods of determining the validity, a logical method is used in the research. In the logical method, face and content validity are both measured. The face validity means that the questionnaire must have at least a face validity, and the content method is to examine the quantity and quality of the questions from the elite's point of view. In this research, the questionnaire was submitted to several urban planners and statistics and modified with changes. The reliability of the questionnaire was evaluated using Cronbach's alpha, which is an internal correlation method, using a single group of test subjects (pre-test). It is stated that if the Cronbach's alpha is greater than .7, then the test has acceptable reliability. Values between .5 and .7 are relative reliability and less than .5 are unreliable. The reliability of this research, in which demographic questions such as gender, occupation, and education level are not considered, is acceptable (Table 2).

Table. 2
Reliability indices

No. of questions	Standardized Cronbach's alpha	Cronbach's alpha
25	.774	.760

4. Case study

Tehran's Nabovat Square is one of the urban spaces in which urban life has been manifested in the best possible way. This area is very crowded during the hours of the day and this busy period continues until the very first hours of the night, and on the other hand, unlike many urban sprawls that do not cling to the bottom of the night, it is secluded in some hours, in such a way that the dialectical concepts of isolation and congestion emerge up to their thresholds. This feature along with some of the features of space, such as having a relatively spacious space, facilities for moving, stopping and staying in space, the full coverage of the active artifact, and the presence of micro space on the margin of the square make it an appropriate space for a case study in the subject of this research (Fig. 5).

Fig. 5. Nabovat Sq., Narmak (Source: archive of Tehran district 8 municipality)

In order to investigate behavior patterns in Nabovat Square of Narmak, the first step is to investigate the presence of people in this space during daily life hours to identify peak times of solitude and congestion. For this purpose, using the "gate technique", the arrival and departure of pedestrians in this square during the daily life (from 8 AM to 10 PM) has been estimated for eight ninety-minute periods[4] . In this method, for the space studied, twelve arrivals are set for monitoring (Fig. 5).

Of this, the four entrances include the main inflows of the pedestrian stream, which is the main place of entry of people into space at the peak of congestion and the main departure point at peak solitude hours. The necessary traffic for public functions [5] is also counted on the square. A part of the presence of people in the space of the square is an indispensable type of activity due to these functions,

Table 3
Average figure in monitoring entrance and departure

	Time	Morning solitude peak		Period 2		Period 3		Period 4		Evening solitude peak		Period 6		Congestion peak		Period 8	
		Period 1								Period 5				Period 7			
	period	8 - 9:30		9:45 – 11:15		11:30 - 1		13:15 - 14:45		15 – 16:30		16:45 – 18:15		18:30 - 20		20:15 – 21:45	
Num	Gate	In	out	in	out	in	out	In	out	in	out	in	out	in	out	in	Out
1	North Ayat	342	276	534	474	1230	1056	660	804	582	420	1104	816	2718	2526	1242	2292
2	West Golbarg	216	138	360	438	468	672	366	384	288	174	408	300	960	588	606	684
3	South Ayat	654	294	858	492	840	726	456	456	432	354	1182	972	1650	1908	936	1056
4	East Golbarg	336	504	876	508	486	516	450	222	264	420	1380	1206	1518	1302	1194	1038
5	Security police	18	18	42	12	6	12	18	36	0	0	0	18	30	6	0	0
6	Police	54	18	120	90	180	114	102	66	42	96	48	42	6	42	0	0
7	Mosque	0	0	30	6	18	24	90	258	0	0	0	0	0	0	84	108
8	+10 Police	18	6	18	24	96	72	12	6	0	0	0	0	0	0	0	0
9	Azimi Nia 1	6	12	90	30	168	120	84	126	42	36	216	120	438	234	78	42
10	Azimi Nia 2	12	0	78	42	132	162	72	120	12	66	90	192	342	288	48	108
11	Laboratory	12	6	30	30	12	6	6	12	6	6	48	42	96	72	0	0
12	Doctors' offices	18	12	54	12	6	24	12	6	30	12	144	132	198	198	30	36
Total required traffic		120	60	294	174	318	252	240	384	78	114	240	234	330	318	114	144
Total sum		1686	1284	3090	2178	3642	3504	2328	2496	1698	1584	4620	3840	7956	7164	4218	5364
Total selected traffic		1566	1224	2796	2004	3324	3252	2088	2112	1620	1470	4380	3606	7626	6846	4104	5220
Difference between entry and exit		342		792		72			24	150		774		780			1116

and since this kind of presence in space is not studied and investigated in this study, its amount has been estimated and excluded from the study. The prohibition of stopping cars at the margins of the square and the placement of public transport stations outside the middle space of the square and its gates make the quantitative assessment of traffic and the presence of pedestrians in the square through counting more credible. Counts have been repeated on an ordinary day with the same climatic conditions, after carrying out the original count for different hours of a normal day in order to have accurate data[6]. Given that the second observation confirms the results of the first observation, the average figures can be presented in the following table. Fig 6.

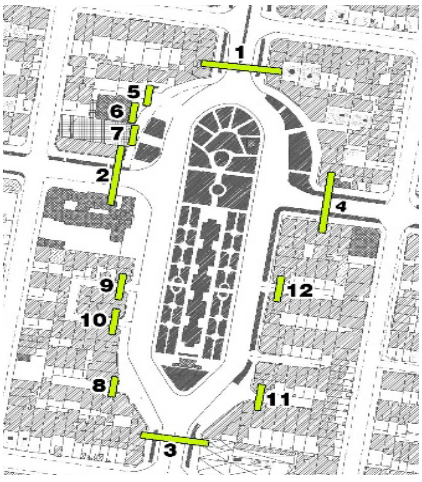


Fig. 6. Arrival and departure monitoring gates at Nabovat

Of this, the four entrances include the main inflows of the pedestrian stream, which is the main place of entry of people into space at the peak of congestion and the main departure point at peak solitude hours. The necessary traffic for public functions[7] is also counted on the square. A part of the presence of people in the space of the square is an indispensable type of activity due to these functions, and since this kind of presence in space is not studied and investigated in this study, its amount has been estimated and excluded from the study. The prohibition of stopping cars at the margins of the square and the placement of public transport stations outside the middle space of the square and its gates make the quantitative assessment of traffic and the presence of pedestrians in the square through counting more credible. Counts have been repeated on an ordinary day with the same climatic conditions, after carrying out the original count for different hours of a normal day in order to have accurate data[8]. Given that the second observation confirms the results of the first observation, the average figures can be presented in the following table.

According to the results, the peak time of solitude (isolation) in the area of the square is the first morning hours (eight to nine and thirty minutes). After that, the greatest solitude time was detected between three and four-thirty. Given that morning solitude is the time when square activities have not yet begun, the afternoon period of solitude is the basis for studying behavior patterns at the peak time of isolation. In the afternoon, the volume of entrance to the squareis about 1700 pph and its exit is estimated to be about 1600 pph, and the peak time of the congestion between six and a half to eight o'clock with around 8000 pphentrance and about 7000 pph of departure is calculated. According to a study by the Space Syntax Laboratory in 1996, moving at least 2 or 3 people per minute, i.e. 120 to 180 people per hour, is essential to ensure that the collision of pedestrians is more or less commonplace, and less than this amount will destroy the sense of security (Hillier, 1997)[9]. On the main course leading up to Nabovat Square of Narmak, at the peak of the solitude, traffic is such that there is a feeling of security, but in its secondary course, traffic is significantly decreased and its effect on behavioral actions can be considered.

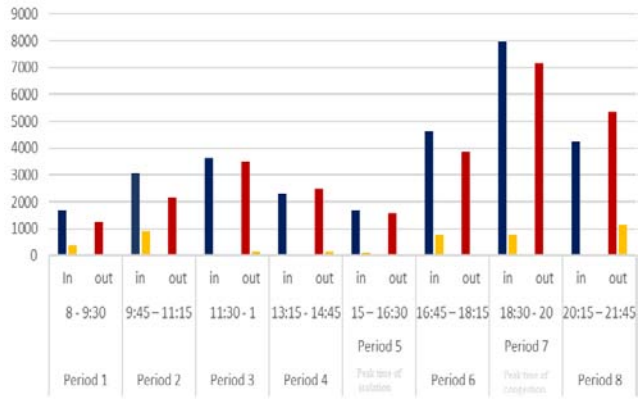
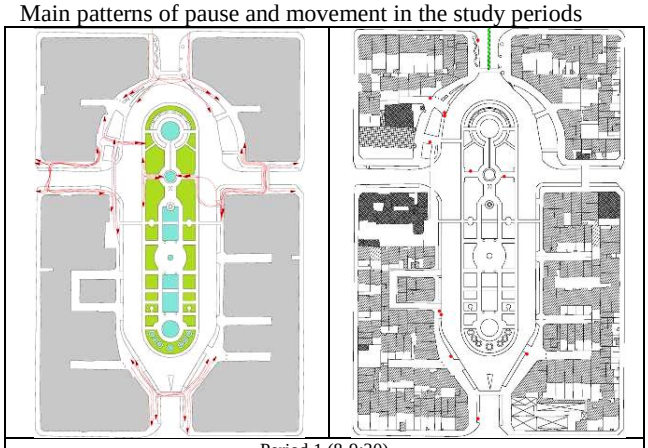


Fig. 7. Comparison of entrance and exit of pedestrians in the Nabovat square and their difference

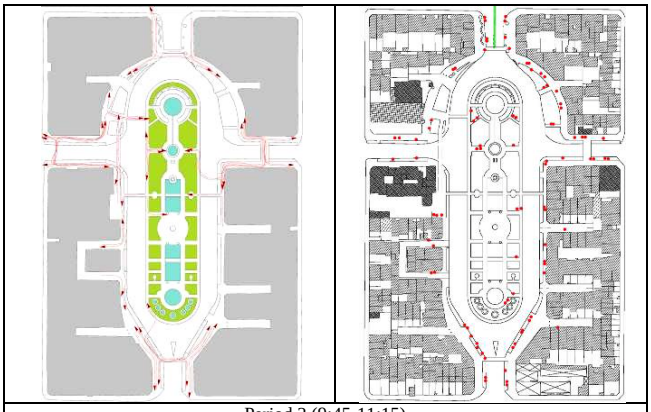
Figure 7 shows that the highest amount of people entering the square space occurs in the second time period of the morning and their greatest departure at the last interval of the evening. In general, the total amount of arrivals is higher than the sum of its exit rates. In all these periods, the pattern of pause and presence in space is simultaneously monitored through observation techniques and the results are used to identify places that are preferred to sit in (appointment, spending time, eating, relaxing, and speaking or watching others). Figure 7 illustrates these patterns and analytical results in normal hours as well as peak periods of solitude and congestion[10.]

Tables 4-11
Main patterns of pause and movement in the study periods



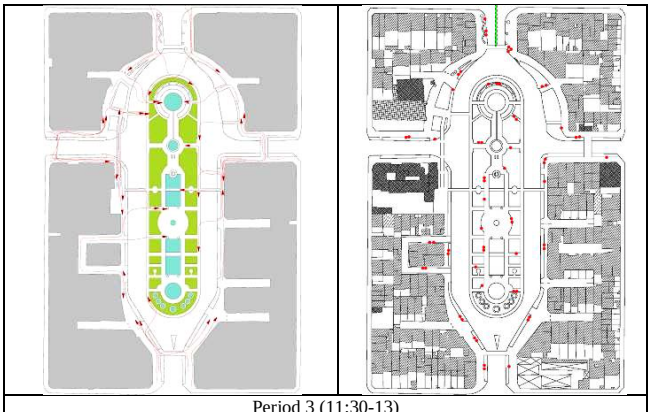
Period 1 (8-9:30)

The static presence of more people in relation to necessary activities, and its location is at the intersections, in front of the municipality and +10 police, and the places that are generally a location for appointment. The presence of people in the middle section of the square is very small and retail activity has not yet begun completely.



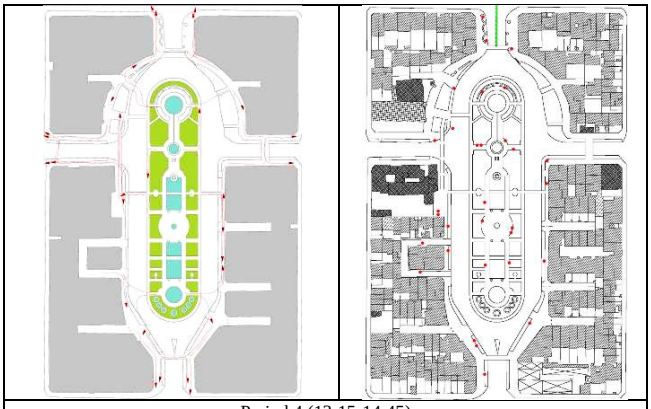
Period 2 (9:45-11:15)

The essential presence of individuals in connection with a limited number of administrative and enforcement applications is ongoing. The intersections are a location for pause and the presence of retailers is gradually increasing. People will enter the middle space and sit there little by little.



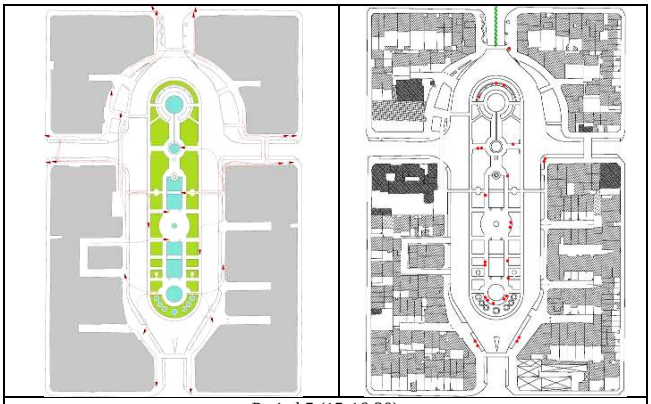
Period 3 (11:30-13)

The essential presence of people in relation to administrative functions is very low. Retail stores and food stores are fully active, sitting in the middle space of the square, especially its interior, and eating and drinking are more. Some of the people who are connected to retailers are entering restaurants and coffee shops located on the top floor of the ground.



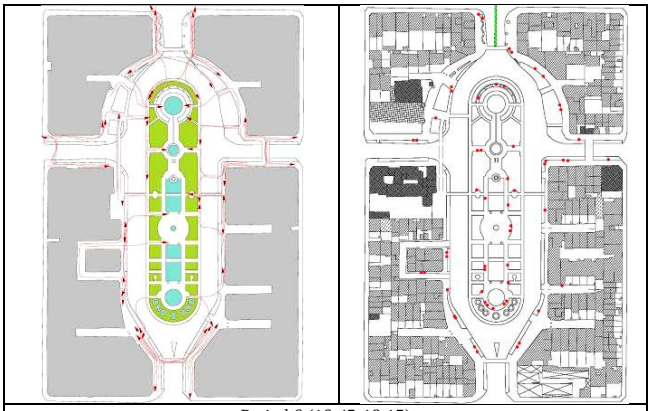
Period 4 (13:15-14:45)

The presence in the periphery and middle space of the square is decreasing. The monitoring of arrivals and exits has also shown that the exit volume from the square is more than the entrance to it.



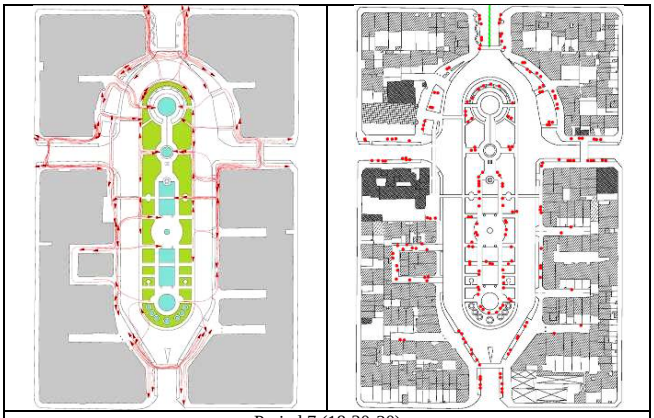
Period 5 (15-16:30)

The square space reaches the peak time of solitude of the afternoon. At this time, people are more present in the appointment area, and sometimes in the middle green space. The presence of women and children at this time will reach the minimum.



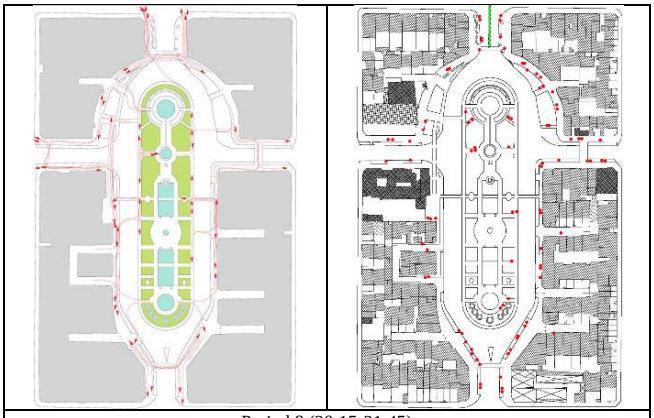
Period 6 (16:45-18:15)

With the tangible increase in people's entry into the space and the crowding of peripheral space, the middle space moves toward crowding. People are gradually entering the micro-spaces around the square.



Period 7 (18:30-20)

The space has reached peak period, where it reaches the level of congestion in some areas. In this period, intersections, edges of peripheral space, and in front of retailers are very busy, and people tend to sit in the middle space. The presence of people in the micro-spaces around the square reaches to the utmost extent.



Period 8 (20:15-21:45)

The space of the square is toward being solitude. The amount of people leaving the space during this period is more than the amount of space entering. At first, the micro-spaces are quickly depleted from the crowd, then the middle of the square becomes vacant. The perimeter of the square, and especially the location of the space connection to the passage around, are the last parts in which the static presence of people is still seen.

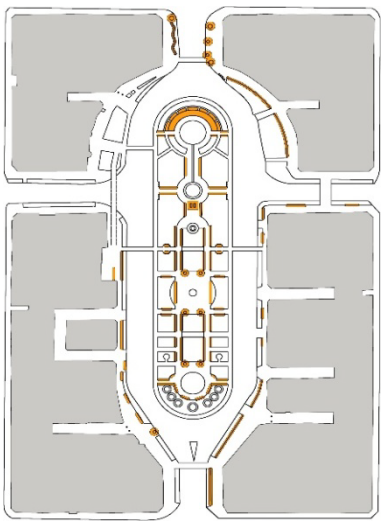


Fig.8. The position of sessions

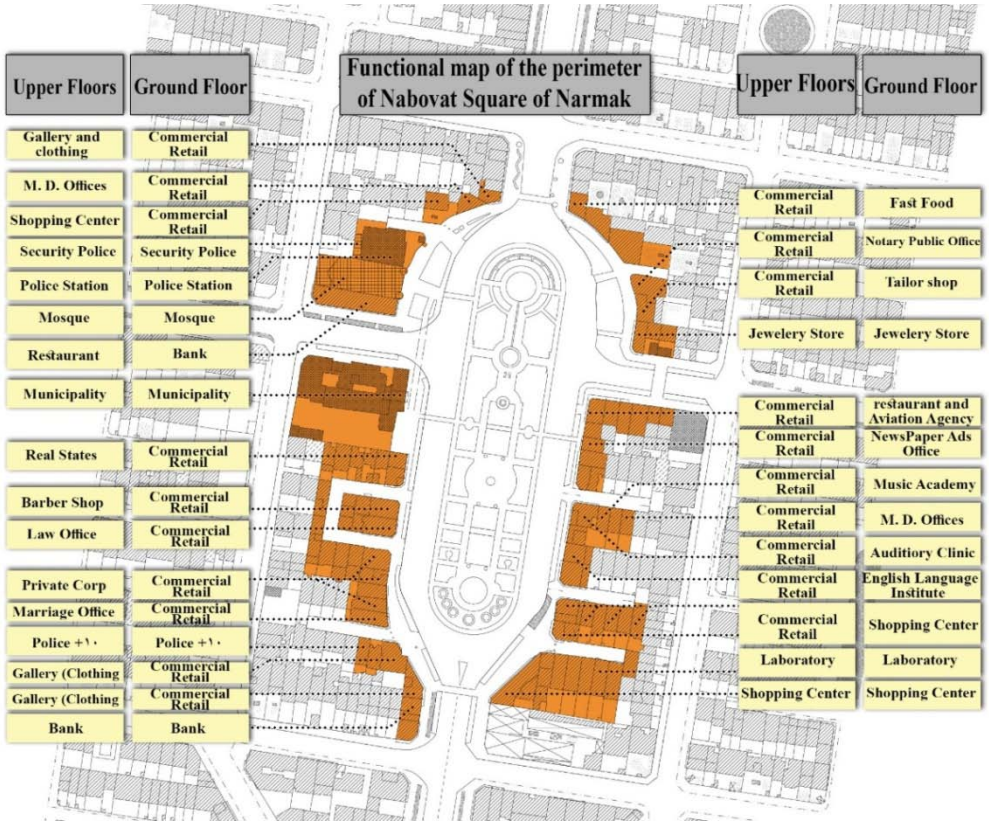


Fig. 9. Square's perimeter functions

On the other hand, during the course of the field research, respondents, all of whom were alternate visitors to the square (targeted samples), were asked about their willingness to do a variety of voluntary activities in the square. The most willingness to use space was for "walking around the square", "window shopping", "shopping", "eating and drinking", "sitting and resting in the middle of the square," "meeting" and "water play".Table.4. the spectrum of willingness to do voluntary activities in the square (%)

Table 12
The Spectrum of willingness to do voluntary activities (%).

Voluntary activities	Too low	Low	Average	Much	Too much
Shopping	8	16	14	18	44
Window Shopping	2	4	14	28	52
Walking Around Square Frontages	6	8	8	22	56
Eat&Drink	10	14	8	28	40
Sit&Rest	10	14	26	16	34
Meeting	8	34	28	16	14
Water play	14	48	16	10	12

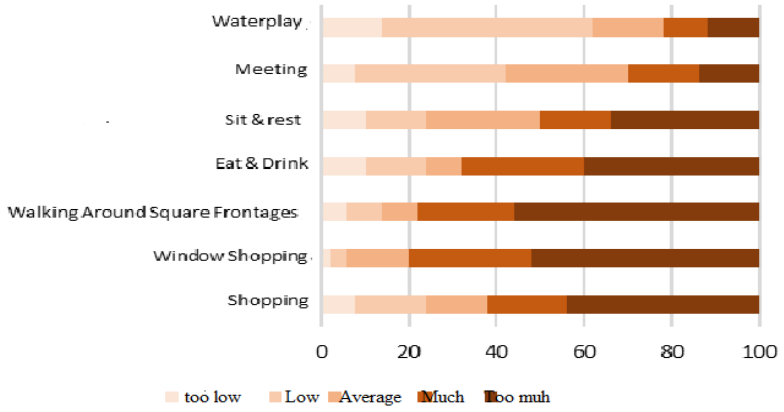


Fig. 10. The spectrum of willingness to do voluntary activities

In response to the question of which activities would be discarded at a time of overcrowding, respondents preferred to discard "walking around the square", "shopping", "water play", and "meetings", and on average, "sitting in the middle of square" is the last activity to be discarded during congestion. Since the observation of behavioral patterns in the congestion range also confirms this point, the middle space of the square can be considered as the preferred space for pause and presence in peak hours at the square. The reason for this can be the distance from the square gates as the most important factor in the presence of people on the edge of the square.

Table 13
priority of discarding voluntary activities in Nabovat Square during congestion (%)

Unwillingness to continue activities during congestion	1	2	3	4	5	6	7
Shopping	22	26	18	14	6	10	4
Window Shopping	8	12	10	10	8	30	22
Walking Around	28	18	14	10	12	8	10
Eat&Drink	14	10	6	8	28	16	18
Sit&rest	4	12	10	14	10	16	34
Meeting	6	8	12	32	24	14	4
Water play	18	14	30	12	12	6	8

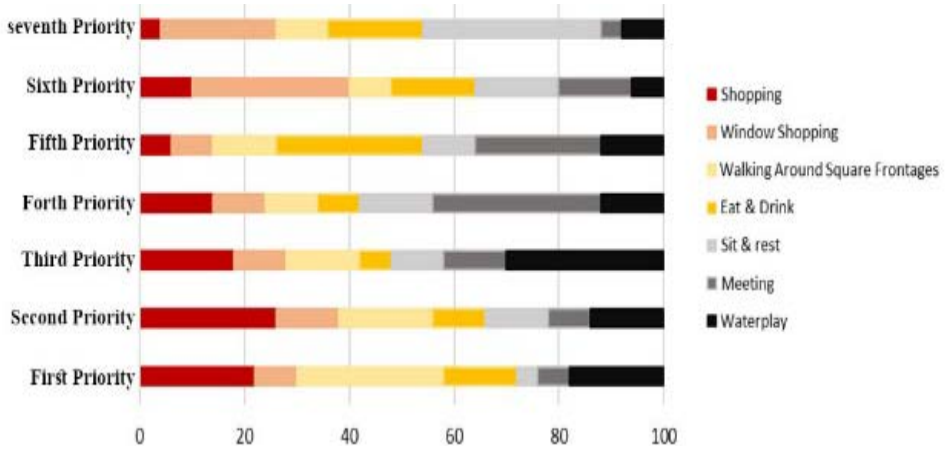


Fig. 11. The spectrum of willingness to do voluntary activities

More than 80% of respondents have a greater willingness to be in space if they are "accompanied with friends and acquaintances", and spent a longer time for activities such as "shopping" and "walking" than those that are alone (even during peak times). This is due to the fact that individuals accept the presence of their loved ones and their entourage within their own privacy, while during a congestion, if people are in the environment alone, this space is occupied by strangers, and feelings of discomfort make people quicker to leave the environment.

5. Conclusion

According to the observations and studies done on the space of Nabovat square of Narmak, the following results can be found regarding the behavior patterns of individuals in relation to optional activities in urban space and its relation with the principles of proxemics in different time intervals, and the thresholds of isolation and congestion:

• In general, individuals are at a public distance with others during peak isolation time, their relationship with other people is very weak, and they gradually feel like to leave the environment. In congestion, the unpleasant feelings of people begin when others enter their personal space and feel themselves in a congestion (Fig.10).

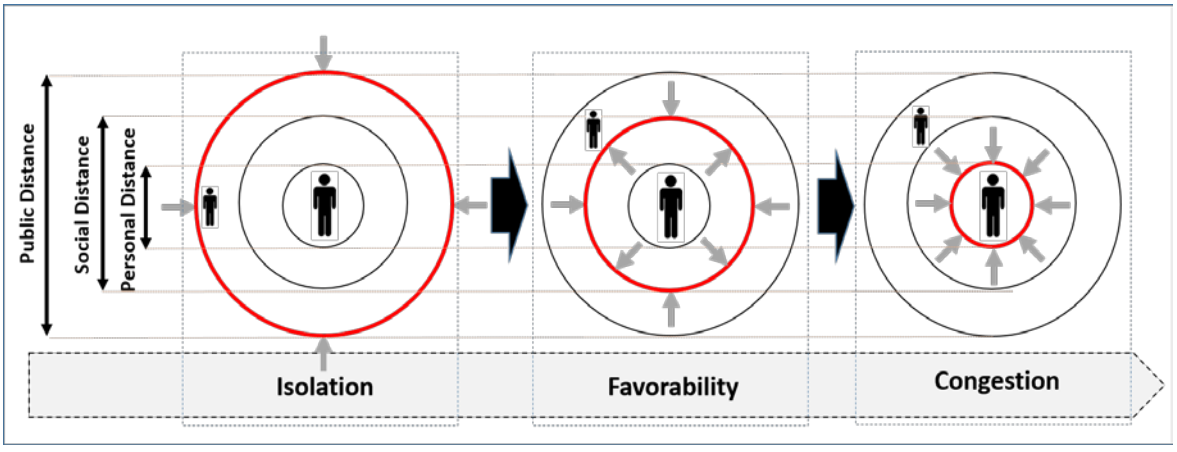


Fig. 12. Proxemics in the thresholds of isolation and congestion in the space (drawn by author adopted from Altman (1975) and Hall (1966)

• Intermittent observation of patterns of behavior in Nabovat square of Narmak has shown that at the time of the peak of isolation in the square, women and children leave the square quickly (before the other groups). But young people spend more time there, and the position of their pause in isolation is the middle space of the square.

• Adaptive behavior during isolation in urban space (at peak of the solitude) includes distance from the edges of space artifacts, penumbra, and pauses in the midst of the square. At the same time, it is greatly dependent on physical comfort (to escape from atmospheric factors).

• When the square passes the peak time of solitude, it coincides with the time when the activities of square edge do not stop but reach the minimum. Since the activities of the edge of the square decrease, people are reluctant to stand on the margin of the square and distance the edges of the square.

• Maintaining a personal distance, which is important as a fundamental issue in the pattern of presence in urban spaces on the threshold of congestion, is not primarily important in the "threshold of isolation"; instead, the need for a sense of security and consequently, being with others is more important and this will separate people from the edges and send them to the middle of the square.

• Adaptive behavior during congestion involves sheltering the passive edges of space. In the meantime, prefabricated sunshades and wide viewing angles are preferred. This is due to the desire to maintain a personal distance, in which case half of the personal space is protected by the edge of the square and the person is only involved in maintaining the other half. Meanwhile, in the peak period of privacy, people prefer to be placed under public surveillance due to the security issue, and prefer visible spaces to hidden spaces from the point of view of others.

• Individuals prefer to stay in the parts of the space that are visually intuitive, while in the time of congestion, the parts that can be controlled more visually from others are more desirable. This can be due to a greater sense of security as a result of public oversight, which is required by a person at a peak time of privacy. While at the peak of congestion, a person is more concerned about maintaining his personal space than feeling insecure, he does not need to be under public control, and on the contrary, he tends to see others instead of being seen.

• During congestion, people will gradually prefer to leave the environment. This is the self-regulating process that William Whyte speaks of (Whyte, 1980, 1988). However, the observations of this study showed that before reaching the stage of escape from space, there are factors that affect its postponement. In other words, there are factors that change the thresholds of congestion and isolation in urban spaces. The presence of active and attractive uses in space makes it possible for individuals to try to adapt to conditions and their willingness to stay in space is increased both during periods of isolation and during congestion. The availability of facilities such as decent halls and locations for staying in space that are sufficiently diversified help increase the visibility and increase these thresholds. In this case, a public space with active uses and convenient facilities, with a larger number of people being accommodated, takes longer time to reach threshold of congestion and people start to get out of space. On the other hand, during privacy meaning isolation,it also takes more time for people to feel insecure or decide to leave the environment.

• The existence of a middle space (sub space or a space from the edges) provides the possibility of leaving the very busy mainstream during congestion and, like a double capacity, delays the "escape" stage and again increases the threshold of congestion. In the time of isolation in the reverse process, individuals move from these sub spaces to the original space. In this way, it can be concluded that the existence of sub spaces will change both thresholds for the presence of individuals in space.

• Another important factor in this issue is the companion of a person with friends and acquaintances. If a person is not alone on both the thresholds of isolation and congestion in the public space, he will tend to continue to exist in space for a longer timeand his adaptive behavior will be much more given that people in his personal space are not strangers during the congestion but acquaintances, and because of the lack of sensation of a vacuum in the social space on the verge of isolation. It is such that if people are not alone and have a companion alongside themselves, are willing to do activities that they cancel if they are alone. The above relationships are presented in Figures 13 and 14. If a person cannot get out of space for any reason, according to Altman (1975), he will reach the stage of anger and aggression in verbal behavior on the verge of congestion and to the stage of fear and anxiety in nonverbal behavior on the verge of isolation.

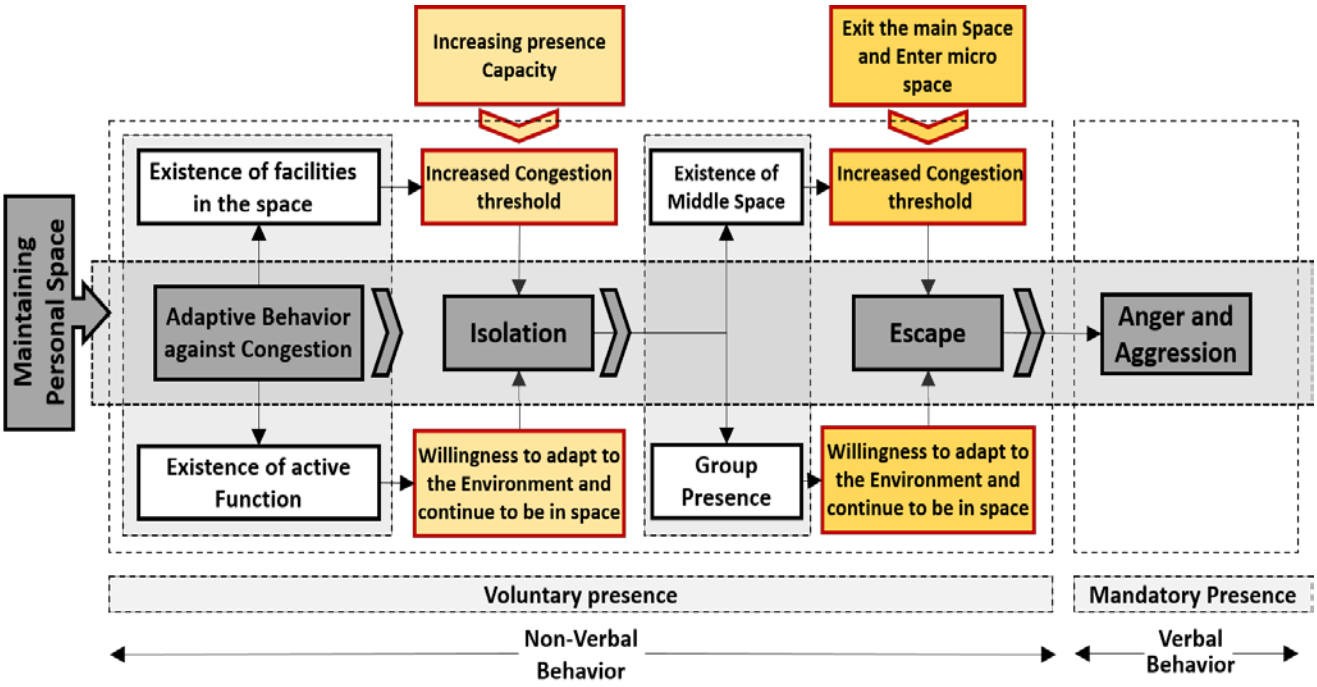


Fig. 13. Factors affecting congestion threshold in the urban space in connection with the patterns of changing adaptive behaviors

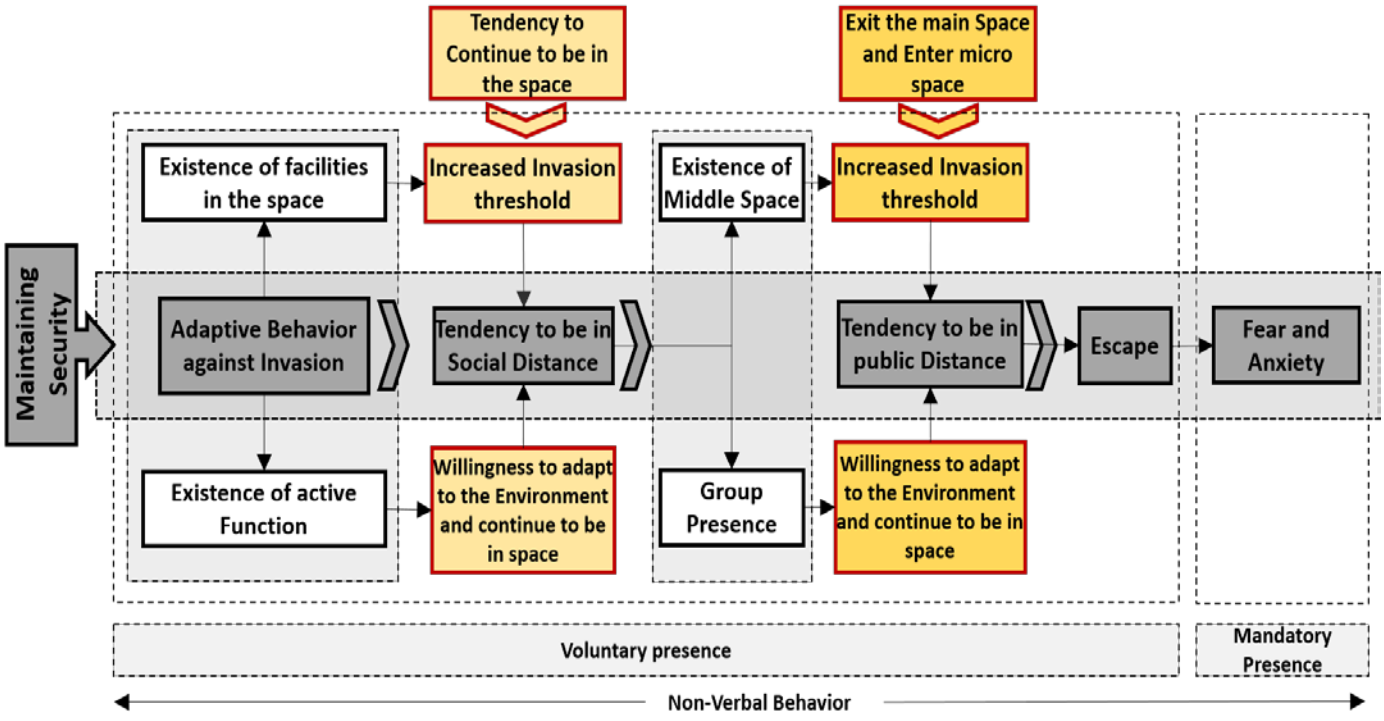


Fig. 14. Factors affecting isolation threshold in the urban space in connection with the patterns of changing adaptive behaviors

FootNotes

[1] Regardless of photographs and images, there is little evidence of the actual rate of static occupancy of space by individuals in traditional samples.

[2] Bosselman called his methodology as "convenience modeling" (Bosselman et al., 1984). He has drawn up maps showing that in a part of the day, depending on the season and according to the position of the sun and the wind, different sections of a public space provide different comfort conditions in terms of temperature. He has provided massive volume models for covering wall buildings to increase sunlight and reduce winds in public spaces.

[3] Public space was grouped into: not redefined (open and flat layout, without space definition), wide structure (its layout has elements such as trees and signs), enclosed with closed view (layout is in such a way that there are obstacles preventing visual access). Results refer to all cases.

[4] The traffic of people at the gates is counted for a period of five minutes and is extended to an hour (one person per hour P.P.H).4- These include security police, 10+ police, law enforcement, labs and doctors' offices.

[5] These include security police, 10+ police, law enforcement, labs and doctors' offices.

[6] The first observation was made on Saturday, May 21, 2016, at an air temperature of 16 to 30 degrees Celsius, and the second observation on Monday, June 13, 2016 at an air temperature of 17 to 30 degrees Celsius.

[7] These include security police, 10+ police, law enforcement, labs and doctors' offices.

[8] The first observation was made on Saturday, May 21, 2016, at an air temperature of 16 to 30 degrees Celsius, and the second observation on Monday, June 13, 2016 at an air temperature of 17 to 30 degrees Celsius.

[9] Results of this study can be found at: Hillier, B. (1997) Moving Diagonally: Some Results and Some Conjunctures (Draft). Bartlett School of Graduate Studies - University College London.

[10] The above pattern is the result of two observations in two different times but in the same climate conditions. The first observation was made on Saturday, May 21, 2016 and the second observation on Monday, June 13, 2016.

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