

The Relationship between Urban Form and Perceived Security; An Empirical Analysis; Case Study: Shiraz City*

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Received 19 November 2017; Revised 12 July 2018; Accepted 24 September 2018; Available Online 19 March 2020

ABSTRACT

In many of today's cities, neighborhoods face a variety of social problems, the most important of which is the lack of social security. On the one hand, this is related to social and demographic characteristics and on the other hand, it is undeniably associated with place. The study of concepts related to urban crime is often carried out under a subfield of criminology called "environmental criminology". In this area, the impact of the surroundings on crime rate is investigated by identifying the relationships between urban form and neighborhood security. The present study aims to investigate the relationship between the main aspects of urban form (density and land-use mix) and the level of security perceived by residents on the scale of an urban block in the neighborhoods of Shiraz Metropolitan. The data are collected from the 2011 Iranian Population and Housing Census report, Geographical Information System (GIS) databases and household questionnaire and quantitative indices. The perceived security indicator is defined and measured based on five variables: fear of crime, experience of crime occurrence, having trusted neighbors, social solidarity and incivilities. According to the results of one-way analysis of variance, there is a significant difference between blocks formed in different time periods (1966 backward, between 1966 and 1989 and from 1989 onwards) in "fear of crime" and "experience of crime occurrence" variables as in the newly developed neighborhoods, the averages of these two variables are less. So in the newly developed zone, the average of these two variables is lower than the other neighborhoods. The results of Pearson's correlation test also indicate that the "experience of crime occurrence" variable is correlated with building density and population density inversely and directly, respectively. Moreover, the share of non-residential land-uses in the studied blocks is directly correlated with the experience of crime occurrence and the fear of crime among residents.

Keywords: Urban Form, Perceived Security, Environmental Criminology, Urban Block.

* This article is derived from part of the second author's thesis entitled "Assessing the Relationship between Urban Form and Social Sustainability at the Urban Block Scale in Shiraz's Neighborhoods" with the supervision of the first and third authors, in School of Art and Architecture, Shiraz University.

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1. INTRODUCTION

The study of urban form as one of the main elements of the city structure has been the focus of many studies in this field. One of the questions that has been raised among many scholars is how the urban form, as a physical concept, can relate to indicators, such as security, that are considered social and psychological concept.

Reviewing past research shows that the relationship between urban form and social dimensions of urban life has been less considered than its environmental and economic dimensions. Thus, the lack of empirical research in this area makes it impossible to precisely judge the role of urban form in socially reinforcing urban neighborhoods. This may be due to the complex definition and measurement of social indicators compared to economic and environmental indicators (Burton, 2000, p. 1970). Accordingly, it is necessary to define comprehensive, practicable measures to confirm or reject the contradictory hypotheses in this area.

On the other hand, in the urban planning system, many social indicators are considered as a series of abstract concepts, and planners refer less to the urban form to investigate the causes of social problems. Understanding the relationships between urban form and social indicators of neighborhoods will reveal what social issues can be caused by urban form, and in other words, what social factors emerge in which patterns of urban form.

Today, many neighborhoods, especially in metropolises, suffer from social problems in various forms, and some others are being destroyed due to the collapse of their social foundations. These problems, the most important of which is the residents' insecurity, are related to social and demographic characteristics on the one hand, and undeniably related to the form of neighborhoods, on the other hand.

Those concepts related to social security in the urban environment are often studied in one of the subfields of criminology, called environmental criminology. In this field, the factors related to the occurrence of crime in the physical environment are sought. So, in addition to designers, planners, and sometimes urban sociologists, criminologists will present their own ideas about urban form. They often believe that planners have limited knowledge of environmental criminology to precisely identify the places of crime occurrence (Brantingham & Brantingham, 1998, pp. 31-60). The results of various studies also show that the theories of urbanism regarding security and its relationship with the urban form are largely different from those proposed by criminologists. For example, urban planners recommend dense urban form with new approaches such as compact city, TOD, and new urbanism, and believe that this model will provide better security for its residents, in addition to many other benefits. But in the field of criminology, dense development is recognized as a factor enhancing the

potential of crime occurrence.

In another study, it was noted that urban and transportation planners define mixed land-use patterns as a way to achieve sustainable development which is achieved by reducing traffic, protecting the environment, increasing physical activities, and preventing chronic physical and mental illnesses (Sohn, 2016, p. 1), and the existence of economies of scale. Advocators of the mixed land-use patterns believe that in environments where land-uses are more diverse, environmental monitoring increases and less crime occur (Browning, Byron, Calder, Krivo, Kwan, Lee, & Peterson, 2010, p. 347; Greenberg, Rohe, & Williams, 1982a, p. 161; Jacobs, 1961; Loukaitou-Sideris & Fink, 2009, pp. 554-87). Contrary to this view, criminologists know the land-use mix as a factor reducing security in urban areas (Brantingham & Brantingham, 2008; Schneider & Kitchen, 2007, p. 226; Taylor, Koons, Kurtz, Greene, & Perkins, 1995, p. 122).

Such disagreements among theorists make it difficult to achieve a single conclusion in examining the relationships between different patterns of urban form and social security. This study scrutinizes the validity of these assumptions by selecting samples including various urban forms in Shiraz City.

The present study aims to investigate the relationship between urban form and social security in urban blocks. In the following, first, the most important theories of environmental criminology are discussed. Then, various studies performed in the fields of criminology, urban planning, transportation, and other sciences related to the city are reviewed.

Next, the "social security" indicator, as one of the most important indicators of social sustainability and one of the most essential requirements of a viable neighborhood, as well as the two "building density" and "land-use mix" indicators, as the most influential indicators in defining the urban form, are studied and evaluated as measures extracted from the theoretical foundations. Shiraz as an expanding metropolis with a population of 1,460,665 according to the 2011 Iranian Population and Housing Census report and a population growth rate of 1.45 percent between 2006 and 2011 was selected as the sample of this study.

2. ENVIRONMENTAL CRIMINOLOGY

The "environmental criminology" concept emerged in the nineteenth century, which referred to as the "dangerous places" in Mayhew's studies (1862) (Cozens, 2008, p. 431). Later in the Chicago school, sociologists such as Robert Park and Ernest Burgess, first raised criminology in the context of place (Brantingham & Brantingham, 1975, p. 273; Cozens, 2008, p. 431).

Environmental criminology is concerned with the study of crime in relation to specific places and the ways in which individuals' activities are formed according

to the place (Cozens, 2008, p. 431). Brantingham & Brantingham consider four dimensions for each crime: law, offender, target (victim), and place (Brantingham & Brantingham, 1981, pp. 78–91). The debate on environmental criminology is mainly concerned with the fourth dimension. In this regard, several theories have been proposed regarding crime and its environment, two of which are briefly discussed here to analyze the relationship between urban form and crime occurrence.

The first theory is the Rational Choice Theory (Cornish & Clarke, 1986), which assumes that most immigrants will logically act in identifying signs in their surroundings and making the necessary decisions. Accordingly, to prevent crime, it can be an effective step to intervene in the environment in a way that would make the crime an unreasonable practice for the offender. This theory has been criticized by some because the actions of an offender always seem logical in his/her view (Eck & Weisburd, 1995, 2015).

The second theory is the Routine Activity Theory. In this theory, like other ordinary people, offenders are involved in their routine activities such as living, leisure, shopping, etc. According to the Routine Activity Theory, four phenomena contribute to the occurrence of any crime: an offender, his or her ignorance of educational and ethical constraints, an appropriate goal, and the absence of a capable guardian (Cohen & Felson, 1979, p. 589; Felson, 2008, pp. 70–76).

According to the above theory, John Eck introduces

a model called “crime triangle” and proposes the abovementioned elements in a different order. According to Figure 1, the crime triangle consists of two inner and outer layers. The inner layer has three phenomena of offender, place and target and the outer layer consists of three elements of handler, guardian, and manager that are in one-to-one correspondence to the phenomena of the inner layer (Felson, 2008, p. 75). In society, an offender needs education and a handler before entering the place of crime. Targets or victims of crime must be guarded against the offender’s attacks. The presence of guardians in neighborhoods can take many forms; guarding is sometimes provided by the presence of security forces; sometimes it is tangibly created by neighborhood residents, which is called “indirect surveillance” and sometimes even the presence of some women in a public space collectively aiming to take care of each other can be some form of guarding. Different urban planning and design patterns are trying to create those environments where indirect surveillance can be enhanced on a planned basis.

Place, as a third phenomenon, requires a manager, or, in the view of urbanism, a planner or a designer to remove the context and potential for the occurrence of crime. Studies on the relationship of urban form and environmental design elements with crime occurrence are carried out to neutralize the third factor, i.e. place of crime, or in other words, to remove a side of the crime triangle.



Fig. 1. Crime Triangle
 (Felson, 2008, p. 75)

In this regard, the Situational Crime Prevention approach, which was developed based on two theories of rational choice and routine activity, can be proposed. This approach seeks to prevent the occurrence of crime or its repetition by relying on environmental cognition (Clarke, 1997). The situational crime prevention approach focuses more on the context and place of the crime than on the offenders and considers the physical, social and psychological characteristics of the environment (Shakoori, 2016, pp. 79–80). Several theories have been presented in this field, the most important of which will be discussed below:

2.1. Eyes on the Street; Jane Jacobs

In this theory, Jane Jacobs considers the security

of a neighborhood or a passage to be dependent on strong surveillance. This surveillance is provided by environmental features. In her theory, she calls observers the natural owners of the street and identifies them in two groups: 1. Residents of houses adjacent to the streets, and 2. Users of public spaces. According to Jacobs, in addition to building houses overlooking the streets, the streets and sidewalks should ensure pedestrian traffic at different times (Jacobs, 1961, p. 35). According to Jacobs, the achievement of this, first and foremost, requires the creation of highly visited public and commercial uses (Ibid, p. 36). If all the above conditions are met, strangers will be the greatest asset to secure the neighborhood (Ibid, p. 40).

2.2. Defensible Spaces; Oscar Newman

The structure of this theory is based on the interaction between individuals and the environment in order to form a defensible space. According to Oscar Newman, defensible spaces rely more on residents' self-help in preventing crime than on government support (Newman, 1996, p. 17). Newman believes that as the number of households living in one area increases, their sense of ownership over their neighborhood decreases equally, and more strangers are given the opportunity to be in the area (Ibid, p. 17). Newman considers the building height and the project scale to be two factors influencing the crime occurrence (Ibid, p. 24). The defensible space theory uses several important concepts in describing its desired spaces.

Legibility: This concept refers to the visual signs in the environment that represent the inhabitants of the area and intimidate or encourage the offender to do a crime. Therefore, if the sense of ownership is induced somewhere, the likelihood of sabotage is much lower there.

Sense of Territory: Newman considers this concept to be a sense of belonging and the extent to which the residents intervene at their place of residence, and believes that as it increases, the likelihood of crime will decrease.

Natural surveillance: Newman introduces this concept as the residents' ability to observe their territory, that is, the ability of the body of a space to provide opportunities for surveillance of it so that as the overlooking of observers over a space increases, the likelihood of crime occurrence decreases (Pakzad, 2008, pp. 288–289).

2.3. Crime Prevention Through Environmental Design (CPTED), Ray Jeffery

Timothy D. Crowe defines this theory as follows: "The proper design and effective use of the built environment in a way that reduces the fear of crime occurrence and crime rate and enhances the quality of life." This theory was first proposed in a book with the same title by Ray Jeffery in 1971. In his theory, he emphasized the importance of preventing crime rather than reacting to it. In this theory, spatial components play a decisive role in the occurrence of crime. So manipulating these components is a good way to reduce crime.

Among the CPTED theorists, there are two general generations. The first generation's view is largely based on the assumption that the likelihood of a crime can be reduced by manipulating the physical environment. The basic strategies presented by the first generation can be summarized as follows: providing adequate visibility, marking boundaries, creating a favorable mental image of the neighborhood, and limiting the opportunity for intruders to access the neighborhood.

The second generation emerged with two criticisms of the first generation. First, the strategies presented by

the first generation only transmit it from one place to another, instead of reducing the likelihood of crime, and second, these strategies focus solely on those offenders who act on assumptions of rational choice theory. Therefore, the second CPTED generation's views are a complement to the first generation's views. In addition to physical stimuli, they also consider the social and cultural stimuli of the environment. Comparing the two generations, it can also be said that the first generation's strategies prevent offenders from entering an area while those of the second generation control the increase of crime in an area (Shariati & Guerette, 2017, pp. 261-268).

2.4. Space Syntax Technique; Bill Hillier

Bill Hillier criticizes the design of a closed complex preventing the natural movement of people and leading to the removal of strangers. According to him, the presence of people in space, whether strangers or acquaintances, enhances natural control of space. As a result, he tries to find the physical features of space that enhance the presence of people and thus a sense of security. In sum, this approach is a theoretical and analytical approach that uses graphical and mathematical methods to describe the relationship between formed concepts and urban space (Shakoori, 2016, pp. 80–81).

3. DENSITY AND SOCIAL SECURITY

Here, density consists of two concepts of building density and population density. It should be noted that high building density does not simply mean the existence of high population density (Cozens, 2011, p. 492). There is also no consensus on what such studies call high density and low density (Cozens, 2011, p. 492; Jenks & Dempsey, 2005, pp. 153–164) and it is relatively defined according to the context of each studied area.

According to the proponents of dense urban form, higher density will reduce crime rates significantly. Because in these areas, the houses are mostly apartment-type and multi-family, and as a result, there is more surveillance of the neighborhood. Today, urban planners and designers mention several advantages for dense development, including adequate access to urban services within walking distance (Cozens, 2008, p. 430), shared urban infrastructures, security and sense of belonging and maximum use of urban lands. In contrast, critics of urban density believe that residents living in low-density areas have higher security (Bottoms & Wiles, 1998; Gove, Hughes, & Galle, 1979; Newman, 1973).

One of the earliest theories in this field is the one presented by Emile Durkheim (1893), which was later completed by Lewis Worth (1938) (Cozens, 2011, p. 496). In their studies on the phenomenon of industrialization and the rapid growth of urbanization, they concluded that in dense urban areas, a sense of

alienation prevailed over citizens, causing crime and incivilities in these areas.

Later, by pointing to some of the collective housings in the United States, Oscar Newman suggested that the great numbers of people's common use of these homes' entrances has increased the potential for crime occurrence in these areas (Newman, 1973). Newman also considers the lack of sense of ownership among the residents of these areas to be a factor effective in the crime occurrence. His study of high-rise buildings in America confirms this assumption.

Rubenstein et al. (1981) specifically focused on population density and believe that since identifying strangers in crowded areas is more difficult for residents of that areas, in areas with higher densities of pedestrian population as well as motor vehicle population, there is a higher the probability of crime occurrence.

Burton (2000) is one of the scholars who examined the impact of urban form on social justice by measuring urban form indicators. One of his goals was to examine the relationship between density and social justice in the compact city model. To this end, he defined 12 indicators to measure social justice on the neighborhood scale in England's cities. The results of his research showed that a compact city affects all indicators of social justice. One of the results of this study was the increased crime rate in dense areas (Burton, 2000, pp. 1987-88).

The results of Harris's (2006) studies on the relationship between crime and population density in Maryland State, U.S., indicated that the frequency of

crime occurrence in each area is positively correlated with the population density of that area. But he also considered that other social factors may moderate this trend. For example, indirect surveillance increases in dense areas, partially affect the abovementioned relationship (Harries, 2006, pp. 30-32).

Bramley and Power (2009) studied a number of neighborhoods in five cities of England to examine the relationship between gross residential density as the most important urban form indicator and social sustainability indices. The results of their studies showed that "satisfaction with residence place", "security", and "housing stability" indicators were lower in dense areas, partly due to social and demographic factors (Bramley & Power, 2009, pp. 45-46).

Dempsey et al. (2012), considering two indices of population density and type of housing, examined the role of urban form in social sustainability in British cities. About security and crime occurrence, the results of their research showed that urban centers with high population density induce a greater sense of insecurity than low-density urban areas (Dempsey, Brown, & Bramley, 2012, pp. 133-134).

Kearns et al. (2012) performed a study on the relationship between building density and residents' fear of crime in some deprived residential neighborhoods in Glasgow, Scotland. They found that residents in high-density neighborhoods felt more insecure while walking in the neighborhood and even at home (Kearns et al., 2012).

Table 1. Summary of Studies on the Relationship between Density and Social Security

Researcher	Measures of Density	Measures of Social Security	Result
Rubenstein et al. (1981)	Population density	Experience of crime occurrence	Identifying strangers in crowded areas is more difficult for residents of that areas, as a result, the likelihood of crime occurrence increases in densely populated areas.
Burton (2000)	Population density and building density	Crime rate	Increase in crime in dense areas.
Harries (2006)	Population density	Crime rate	The frequency of crime occurrence in each area is positively correlated with the population density of that area.
Bramley & Power (2009)	Gross residential density	Security	The "security" indicator is lower in dense areas, partly due to social and demographic factors.
Dempsey et al. (2012)	Population density	Sense of insecurity	Urban centers with high population density induce a greater sense of insecurity than low-density urban areas.
Kearns et al. (2012)	Building density	Fear of crime occurrence	Residents in high-density neighborhoods felt more insecure while walking in the neighborhood and even at home.

4. LAND-USE MIX AND SOCIAL SECURITY

Proponents of land-use mix claim that the mixture of residential and non-residential land-uses will reduce crime rates in the neighborhood by creating social interactions and residents' indirect surveillance of their neighborhood. Jane Jacobs believes that the way to reduce crime is to form various land-uses in the neighborhood. This variety of land-uses encompasses a range of residential, commercial, office and recreational functions at the neighborhood level and within the blocks. In her view, the existence of multifunctional areas results in the continuous movement of people around the neighborhood at different times of the day (Jacobs, 1961).

Jacobs knows the creation of land-use mix as the most effective way to establish indirect surveillance at the neighborhood level (Greenberg, Rohe, & Williams, 1982b, p. 162; Jacobs, 1961). Strangers who come into the neighborhood due to a variety of land-uses are the key characteristic of the model Jacobs presents for her claim (Browning, Byron, Calder, Krivo, Kwan, Lee, & Peterson, 2010, p. 334). These people actually create the surveillance and control required to create security in the neighborhood. Thus, from Jacobs's view, neighborhoods with mixed and various land-uses lead to the creation of safe and controlled neighborhoods.

The study by Hillier and Shu (2000) confirms Jacobs's theory. Raudenbush & Sampson also found a negative relationship between land-use mix and crime rates by examining the safety of public spaces in Chicago's neighborhoods (Raudenbush & Sampson, 1999, pp. 123–153). Browning et al., in their study of land-use patterns in some neighborhoods of Columbus city, Ohio State, concluded that creating land-use mix as long as it doesn't exceed a certain threshold, can significantly prevent suicide and aggressive attacks in the neighborhood (Browning, Byron, Calder, Krivo, Kwan, Lee, & Peterson, 2010, pp. 329–357).

Sohn (2016), in his study in Seattle, Washington, examined the relationship between land-use patterns and local crime occurrence. Unlike earlier researchers who had studied local land-uses with an overall approach, Sohn investigated the effects of land-use type on the rate of crimes, such as theft. He eventually considered commercial land-uses as a factor effective

in attracting thieves and offenders to the neighborhood. His emphasis was more on the type of commercial land-uses of the neighborhood, such that in some land-uses such as large shopping malls, strangers are more likely to be attracted to them, and residents' surveillance over them is less. While smaller-scale land-uses are more indirectly surveilled by in-situ residents, thereby reducing the likelihood of crime occurrence in their surroundings (Sohn, 2016, pp. 148–158).

In contrast to the first approach to the land-use model, another perspective can be mentioned, which is mainly advocated by criminologists. Theorists of this perspective believe that the existence of mixed land-uses in urban areas increases the potential for crime.

Taylor sees street activity as a function of the residential and commercial density of that area. In this case, pedestrian traffic increased while these people are not familiar with each other. Taylor's description is similar to Jacobs's one to this point. But the difference between their views is the role of strangers who are attracted to the neighborhood by land-uses. Taylor believes that the presence of these strangers creates a sense of insecurity among neighborhood residents and makes them reluctant to use public spaces around them (Taylor, Koons, Kurtz, Greene, & Perkins, 1995, p. 122). According to this theory, the presence of strangers does not only promote social surveillance over the neighborhood but also weakens residents' sense of responsibility and sense of belonging to their surroundings and promotes a sense of insecurity amongst them, making the neighborhood more prone to crime.

There are numerous studies in this area that support the second view. For example, Greenberg et al. (1982) studied six neighborhoods in Atlanta, Georgia, and found that heterogeneous residential land-uses attract strangers into the neighborhood (Greenberg, Rohe, & Williams, 1982b). Taylor et al. (1995) examined some samples in Baltimore and Philadelphia and found that those residential blocks with more non-residential land-uses suffer from more social incivilities than other blocks, due to the attraction of more strangers (Taylor, Koons, Kurtz, Greene, & Perkins, 1995). Burton (2000) also found in his studies a positive relationship between land-use mix and crime occurrence in neighborhoods (Burton, 2000).

Table 2. Summary of Studies on the Relationship between Land-use Mix and Social Security

Researcher	Measures of Density	Measures of Social Security	Result
Greenberg et al. (1982)	Land-use mix	Insecurity	Heterogeneous residential land-uses attract strangers into the neighborhood
Fuller (1989)	Neighborhood's physical characteristic	Crime rate	The land-use mix enhances security in the neighborhood.
Taylor et al. (1995)	Land-use mix	Social incivilities	those residential blocks with more non-residential land-uses suffer from more social incivilities than other blocks, due to the attraction of more strangers

Researcher	Measures of Density	Measures of Social Security	Result
Raudenbush & Sampson, 1999	Land-use mix	Crime rate	There is a negative relationship between land-use mix and crime rate in public spaces.
Burton (2000)	Land-use mix	Crime rate	There is a positive relationship between land-use mix and crime occurrence in the neighborhoods.
Browning (2010)	Land-use mix	Aggressive attacks	Creating land-use mix as long as it doesn't exceed a certain threshold, can significantly prevent suicide and aggressive attacks in the neighborhood
Sohn (2016)	Land-use pattern	Local crime occurrence	Commercial land-uses act as a factor attracting thieves and offenders to the neighborhood at macro level.

5. CASE STUDY: SHIRAZ CITY

In the present study, the studied areas were selected from residential blocks of Shiraz, Iran. The number of households residing in Shiraz was 412423 according to the 2011 Iranian Population and Housing Census report, some of which were selected as samples to be questioned and analyzed. In the following, the research method, questionnaire design process, and sample distribution in the statistical population are explained in more detail.

5.1. Method

This research is an applied, descriptive-analytical study. In this research, first, by reviewing references

and interviews, the key indicators influencing the study of urban form were found, and then, by consulting with experts and matching the indicators with the studied area, some measures were developed to measure them. Totally, the “density” and “land-use mix” indicators, each with two measures, were selected to examine and analyze the relationship between them and the “social security” indicator, with five measures (Table 3).

The study of indicators was performed using a comparative approach. That is to say, the present study aims not to examine the impact of urban form on social security, but rather to examine the relationship between urban form indicators and social security. Therefore, to achieve the desired results, it is required to examine and compare a significant number of samples.

Table 3. Developed Indicators and Measures

Indicator	Measure	Reference
Density	Population density (the number of people per unit of area)	2011 Iranian Population and Housing Census report
	Building density (the total floor area of buildings divided by land area of the lot)	Geographical information system (GIS) databases of Shiraz's revised detailed plan, 2014
Land-use Mix	Land-use mix entropy	Geographical information system (GIS) databases of Shiraz's revised detailed plan, 2014
	$Entropy = \sum_j P_j \times \frac{ \ln(P_j) }{\ln(J)}$	Geographical information system (GIS) databases of Shiraz's revised detailed plan, 2014
	Average distance of lots from commercial land-uses (within a 400-m radius of the block)	
Social Security	Fear of crime occurrence	Questionnaire
	Experience of crime	Questionnaire
	Trusted neighborhood	Questionnaire
	Social solidarity	Questionnaire
	Incivilities	Questionnaire

In this study, the qualitative measurement was applied using two subjective and objective approaches were used. The objective approach was used to measure the indicators using precise measurable data including:

Shiraz's geographical information system database and the 2011 Iranian Population and Housing Census report. The metrics related to urban form indicators were calculated using the entropy model and network

analysis tool in Arc GIS 10.2.2 software. The subjective approach was used to examine the “social security” indicator based on the mental perception of the residents of the blocks. This indicator was obtained by distributing the questionnaires among the residents of the sample blocks. Finally, the required analyses on the measures were performed using SPSS 23 software. For those variables with normal distribution, parametric tests, otherwise, nonparametric tests are used. The main analysis of this research is correlation analysis, which is performed to examine variables in pairs and determine the relationship between them.

5.2. Questionnaire Design Process

Five measures were developed to measure residents’ perceived security of their neighborhood, which were asked with 17 questions (on Likert-scale). In the first part of the questionnaire, the demographic characteristics of the respondents including their age, gender, marital status, education, and occupation were asked. Since the questionnaire was a researcher-made questionnaire, it is necessary to examine its validity and reliability. The concept of validity answers the question of how much the measuring tool measures the desired characteristic. In this research, in addition to consulting with experts, it was attempted to conduct a careful study of the target groups in order to gain a detailed knowledge of them and, consequently, to localize the indicators extracted from the theoretical foundations according to the study framework. Before completing the questionnaires, a limited number of them were distributed among the residents to eliminate or correct questions if there were specific responses to them. Accordingly, the questions were corrected or modified over several stages to obtain the desired result.

The “reliability” concept refers to the extent to which the measuring tool yields the same results under the same conditions. One of the methods used to calculate reliability is Cronbach’s alpha. This method is used to calculate the internal consistency of the measuring tool, including questionnaires or tests that measure different properties. In such tools, the answer to each question can be given different numerical values. In this study, Cronbach’s alpha was estimated using SPSS software. If the Cronbach’s alpha coefficient is greater than 0.7, it can be said that the questionnaire has good reliability. By calculating Cronbach’s alpha coefficient for 17 items of this questionnaire, this value was estimated 0.805 which indicates the appropriate reliability of the questionnaire.

5.3. Sample Block Selection Process

According to the Cochran formula with a 5% error rate, 383 households were questioned as samples. The sample households lived in a total of 46 urban blocks. The sample share in each block was proportional to the total number of households living in it. In each block, households were highly homogeneous in terms of social characteristics studied. According to the purpose of the research, the distribution of samples in the physical context of the city was such that the above statistical blocks were sufficiently diverse in the urban form components. The selected blocks were related to three different periods in terms of urban texture formation: 1. 1966 backward; 2. Between 1966 and 1989; and 3. 1989 onwards. The blocks also had to be significantly different in terms of the three basic physical elements of the urban form, including street network, components, and buildings.

6. ANALYSIS

In this section, the statistical analyses were performed first on the household scale and then, on the statistical block scale. In this regard, first, the respondents’ personal characteristics were examined in relation to their mentalities of social security variables. According to the results of the Kolmogorov-Smirnov test, the sigma coefficient was higher than 0.05 only for the variable of “fear of crime occurrence”, indicating that the distribution of security variables among the sample population was only normal in this variable. So, parametric tests were applied just for this variable and nonparametric tests for the other variables.

To investigate the correlation between variable, if they have a normal distribution, Pearson’s correlation coefficient is used, and otherwise, the Spearman’s correlation coefficient can be applied. Pearson’s correlation coefficient (for “fear of crime occurrence” variable) and Spearman’s correlation coefficient (for other variables) were used to examine the correlation between respondents’ age and security variables. The results of Pearson’s correlation test showed no significant relationship between the “fear of crime occurrence” variable and security. While the results of Spearman’s correlation test showed that for the variables of “trusted neighbors” and “social solidarity”, as residents’ age increases, their trust in neighbors and their social solidarity with the residents of the neighborhood increases (Table 4). In this analysis, no significant relationship was found between respondents’ age and other variables of social security.

Table 4. Spearman’s Correlation Coefficients between Social Security Variables and Respondents’ Age

Variable	Trusted Neighbors	Social Solidarity
Age	0.230**	0.134*

*: 1% Significance Level; **: 5% Significance Level

Moreover, to compare the two male and female groups in terms of the above variables, paired t-test (for “fear of crime occurrence” variable) and non-parametric Mann-Whitney test (for other variables) were used. The results of these two tests showed that there was no significant difference between men and women in their mentality of social security in their

neighborhood.

At the studied block scale, since the results of the Kolmogorov-Smirnov test showed that all sigma coefficients were greater than 0.05 (Table 5), it was concluded that the quantitative variables had a normal distribution and parametric tests were used to analyze them.

Table 5. Kolmogorov-smirnov Coefficients

Variable	Sig. (2-Tailed)
Fear of Crime Occurrence	0.200
Experience of Crime	0.200
Trusted Neighborhood	0.053
Social Solidarity	0.088
Incivilities	0.200

Using a one-way ANOVA test, blocks located in the zones related to three texture formation periods were compared in terms of residents’ perceived security

variables. The results showed significant relationships between the zones in all variables (Table 6).

Table 6. Results of One-way ANOVA Test

Variable	F	Sig.
Fear of Crime Occurrence	3.79	0.034
Experience of Crime	14.28	0.000
Trusted Neighborhood	3.88	0.029
Social Solidarity	3.52	0.049
Incivilities	4.09	0.021

To determine which groups were different, the Least Significant Difference (LSD) was used. The results showed that there is a statistically significant difference between the newly developed zone (related to the period of 1989 onwards) and each of the two other zones (related to the periods of 1966 backward and between 1966 and 1989) in the “fear of crime occurrence” and the “experience of crime” variables. By comparing the averages of groups, it was found

that this difference implies the improvement of the status of the newly developed area in terms of the “experience of crime occurrence, compared to the other two areas”. Accordingly, in the variables of “trusted neighbors”, “social solidarity” and “incivilities”, a significant difference was observed between newly and middle developed areas. As such, the average values obtained for the newly developed area are lower than the other two areas (Table 7).

Table 7. Comparison of Different Areas of Shiraz City (in Terms of the Formation Period) in Average Values of Social Security Variables in Sample Blocks

Variable	Inner Developed Zone	Middle Developed Zone	Newly Developed Zone
Perceived Security	3.22	3.29	3.73
Experience of Crime	3.39	3.60	4.82
Trusted Neighbors	3.25	3.54	2.68
Social Solidarity	2.89	2.93	2.43
Incivilities	3.58	3.69	3.11

Then, the Pearson’s correlation test was used to examine the relationships between pairs of variables. Two investigated the “density” indicator, two measures of population density and building density were evaluated. According to the results of Pearson’s correlation test, among the five measures of social security, only the “experience of crime” was

significantly correlated with population density so that at higher population densities, residents experienced more crime (Table 8).

About the land-use mix indicator, after calculating the land-use mix entropy for all land-uses, the results of Pearson’s correlation test showed that in blocks with more diversity in access to different types of land-uses,

residents' fear of crime occurrence was higher and they observed more crimes. The results of the study of residents' access to local land-uses also confirm the abovementioned result for two "fear of crime occurrence" and "experience of crime" measures. But

in those blocks where the lots had better access to local commercial land-uses, residents better trusted in each other and had greater social solidarity, and less social incivilities occurred in them (Table 8).

Table 8. Pearson's Correlation Coefficients between Social Security Variables and Urban Form

Indicator	Variable	Fear of Crime Occurrence	Experience of Crime	Trusted Neighbors	Social Solidarity	Incivilities
Density	Population density		0.321*			
Land-use Mix	Land-use mix entropy	0.358*	0.617*			
	Average distance of lots from surrounding commercial land-uses	-0.394*	-0.516**	-0.356*	-0.313*	0.404**

-: Negative Correlation; *: 1% Significance Level; **: 5% Significance Level

7. FINDINGS AND DISCUSSION

The research findings showed that population density has a direct and significant relationship with the "experience of crime" variable, which is inconsistent with Jacobs' "Road Eyes Theory" and Bill Hillier's "Space Syntax Theory". About areas of high population density, Jacobs believes that strong social surveillance prevents crime occurrence. Bill Hillier knows strangers as a factor strengthening natural surveillance, while according to the Routine Activity Theory, offenders are considered part of the same guardians (Felson, 2008, pp. 70–76), who, like other people, do their routine activities.

The abovementioned relationship, in addition to confirming the Routine Activity Theory, points to the similar results obtained in the studies on the relationship between population density and crime occurrence (Bramley & Power, 2009, pp. 45–46; Burton, 2000, pp. 1987–1988; Dempsey, Brown, & Bramley, 2012, pp. 133–134; Harries, 2006, pp. 30–32; Newman, 1973; Rubenstein, Murray, Motoyama, Rouse, & Rouse, 1981). One of the most important factors effective in forming this relationship, as Rubenstein et al. (1981) have pointed out, is the difficulty of identifying strangers in areas with higher population density by residents. In the studied blocks, this result can be largely attributed to the traffic-passing role of internal passages of the texture. In most of these blocks, internal passages, due to their traffic-passing role, make it difficult to distinguish acquaintances from strangers and, on the other hand, play a poor social and regulatory role. This, on the one hand, and the multiple movements of pedestrians and motor vehicles, which facilitated the experience of various social events, including crime, on the other hand, contribute to this relationship.

About land-use patterns, the findings are more prominent in the first two variables of social security, namely residents' fear of crime occurrence and their experience of crime. In blocks where and around which there were more types of non-residential land-uses,

residents felt less secure and observed more crimes. The obtained result is inconsistent with the results of the studies by Fuller (1989), Raudenbush & Sampson (1999), Browning et al. (2010) and Sohn (2016). This result largely confirms the studies by criminologists, including Greenberg et al. (1982), Taylor et al. (1995) and Burton (2000).

As noted in these studies, the cause of such a relationship is the presence of strangers due to a variety of land-uses in and around residential areas. Because one of the characteristics of urban crime is that people's unfamiliarity with each other leads to their aggravation and, on the other hand, when people are acquainted with one another, they can no longer easily commit a crime in public spaces (Akbari & Pakbonyan, 2012, p. 54). Although according to Jacobs and some scholars after her, the presence of strangers results in increased social surveillance in the neighborhood, in the present study and similar cases following the Routine Activity Theory (Felson, 2008, pp. 70–76), the presence of strangers and therefore the offenders among them will have a far greater impact on the neighborhood than the social surveillance. In the present study, in addition to the land-use mix, the effect of the distance to non-residential land-uses on the crime occurrence was also investigated. About the first two variables, the fewer distances to these land-uses showed similar results to those obtained for land-use mix. This suggests that in addition to the variety of non-residential land-uses, the distance to these land-uses and, in other words, their increasing influence on the residential context, strengthens residents' experience of crime and their sense of insecurity. In contrast, the values of "trusted neighbors" and "social solidarity" are greater in these blocks.

The reason behind this can be explained as follows: local-scale commercial land-uses will have different impacts on security variables since they are predominantly located on the outer edge of neighborhoods and in the surrounding street body. On the one hand, these land-uses attract strangers as well

as offenders to the neighborhood and cause crime and insecurity to the inhabitants, and on the other hand, by creating a space for the interactions between these inhabitants, they increase their solidarity and trust in each other. Moreover, less occurrence of incivilities has been observed in these areas, which may be due to the fact that the causes of the incivilities are largely different from those of the crime. In other words, in such studies, incivilities are mainly behaviors that have more psychological impact than financial loss and casualties, and that is why they are classified as a category separate from crime. In such cases, some physical characteristics are found to reduce the sense of security although they reinforce social solidarity (Soltani, Izadi, & Mozayani, 2009).

8. CONCLUSION

The present study aimed to identify the relationship between urban form and social security. After examining various theories and studies on the topic, selected urban blocks in Shiraz were investigated as

samples. The two “density” and “land-use” indicators, as the main urban form indicators, were quantitatively evaluated with measures such as population density, building density, land-use mix and distance to commercial land-uses. Additionally, citizens’ social security was quantitatively assessed with five measures derived from the theoretical foundations, namely fear of crime occurrence, the experience of crime, trusted neighbors, social solidarity, and incivilities. Data were analyzed using one-way ANOVA and Pearson’s correlation tests. The results showed a perception of more crime in blocks with higher population density, confirming the criminological theory of Routine Activity. Land-use mix, as the second indicator of urban form, showed that in blocks where and around which there were more types of non-residential land-uses, residents felt less secure and observed more crimes. The overall results obtained from this study are mostly interpretable within the framework of the Routine Activity Theory and are more consistent with the assumptions of this theory.

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HOW TO CITE THIS ARTICLE

Hajipour, K.H., Fakhrahmad, S.M., Soltani, A., & Lotfi, S. (2020). The Relationship between Urban Form and Perceived Security; An Empirical Analysis; Case Study: Shiraz City. *Armanshahr Architecture & Urban Development Journal*. 12(29), 237-249.

DOI: 10.22034/AAUD.2020.102358

URL: http://www.armanshahrjournal.com/article_102358.html



