

EXAMINING THE FACTORS AFFECTING USERS' SECURITY PERCEPTIONS ON A PEDESTRIAN STREET: A CASE STUDY OF ÇARK STREET, SAKARYA, TURKEY

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Highlights:

- security perception on pedestrian streets depends on environmental and social factors;
- lighting, and presence of a security officer enhance perception of security;
- visit frequency, and duration influence security perception;
- arrival distance, and visiting style significantly affect perceived security.

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Abstract. While main streets in cities provide pedestrians with opportunities such as shopping and recreation, visitors' perceived security can influence pedestrian traffic at such streets. Similarly, sociodemographic backgrounds of pedestrians can affect their perceptions of safety and security. Therefore, the purpose of this research is to find out the factors that affect perceived security in urban pedestrian streets. In this direction, pedestrians' security perceptions were systematically investigated by conducting 200 face-to-face surveys at Çark Street, a well-known pedestrian street in the city of Sakarya (Turkey). Çark Street is 550 m long, 15...20 m wide and made of stamped concrete paving. The street was pedestrianized in early 2000s. There are commercial establishments such as clothing stores, restaurants, technology stores and gift shops, while offices for various professional groups (such as doctors, lawyers, accountants), cafes and residences are located in the upper levels of buildings. The questionnaire was composed of 3 parts as follows: Part 1 included 3 questions to collect respondent demographic information such as education and income level; Part 2 included 6 questions to find out respondents' reasons to visit Çark Street, as well as the frequency and timing of their visits; Part 3 had 25 questions to investigate pedestrians' security perceptions. The degree at which various factors such as crowd and street lighting that influence security perceptions were measured by using Likert scale and relevant statistical analyses. The results indicated that landscape reinforcement elements, as well as frequency and duration of a visit influence visitors' security perceptions. The results show that security perception changes based on gender and timing of a visit. For instance, female visitors tend to feel more unsafe than male visitors during the evening hours. Based on the findings, suggestions are offered for designing safe and secure pedestrian streets. Overall, this study offers a guideline for safer, secure, and successful pedestrianization of critical urban settings in terms of pedestrian preference.

Keywords: pedestrianization, pedestrian traffic, perceived security, satisfaction, transportation, urban space.

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1. Introduction

Pedestrianized streets constitute a vibrant and dynamic crowd that frequents these bustling environments for purposes such as shopping, business, and socialization. A fundamental aspect of such urban spaces is the safety and security of its visitors. This key factor is essential for business viability, crime prevention, positive public perception, and overall quality of that environment (Affleck *et al.* 2019). In general, safe urban zones evolve into economically and socially viable areas that are conducive to growth, development, and overall prosperity (Ruijsbroek *et al.* 2015).

Pedestrianized streets, often referred to as complete streets, offer multiple advantages for urban life and development. Past studies indicate that these streets ease pedestrian movement and serve as safer environments without vehicle traffic (Shahmoradi *et al.* 2023). Likewise, such streets encourage physical activity and help diminish reliance on vehicles (Jabbari *et al.* 2023). As a result, air quality of pedestrianized streets usually is better than the streets that are exposed to vehicle emissions (Slater *et al.* 2016). Furthermore, pedestrians can conveniently reach

bus stops and subway stations at these streets, which improve the accessibility and efficiency of public transportation (Salaheldin *et al.* 2023). Although municipalities consider numerous benefits of pedestrianized streets, they tend to overlook visitors' security perceptions. In fact, perceived security directly influences duration and frequency of visits, which further affects socio-economical development of such urban settings (Painter 1996; Sreetheran, Van den Bosch 2014).

Several features including infrastructural, environmental, demographic, and safety and security aspects are among the essential design criteria of a main street. Infrastructural aspects include factors such as road alignment and traffic flow, drainage and flood control, utility networks (electricity and gas) and accessibility (e.g., pedestrian, cyclists, motorists, and emergency vehicles) (Lam 1989). Environmental issues include air and noise pollution control, minimal graffiti and litter, eco-friendly and green structures, aesthetics, proper landscaping, and well-planned public spaces (Johnston, Shimada 2004; Seaman *et al.* 2010). Demographic attributes include people's preference of such urban settings. In many studies, gender and age are among the demographic factors that are studied in the context of perceived security in public spaces. Tuncer & Akdemir (2021) indicated that perceived security differs according to gender. Müderrisoğlu & Demir (2004) stated that evening hours are the most suitable time periods for the working population to benefit from public spaces; however, women tend to avoid urban green spaces at this time because they fear darkness and low visibility. Similarly, there are possible relations between perceived security and visitor demographics such as education, income, age and gender (Türkseven Doğrusoy, Zengel 2017). Accordingly, several studies suggested that perceived security in urban areas where social, economic, and cultural differences are experienced is a critical issue to be studied (Apak *et al.* 2002). Security factors involve measures such as effective lighting and clear visibility during day and night, police presence and crime prevention, clear signaling, surveillance, and security cameras (Loewen *et al.* 1993; Uittenbogaard *et al.* 2018).

Feeling unsafe or the fear of being potentially harmed by a possible crime is a critical factor that negatively affects people's decision to visit a public space (Madge 1997). Thus, security issues and concerns must be integrated in the process of designing public settings such as a pedestrian street (Bedimo-Rung *et al.* 2005). In this context, factors affecting the perceived security can be divided into 5 categories: structural design, urban planting design, visiting frequency, crowd perception, satisfaction with the area (Türkseven Doğrusoy, Zengel *et al.* 2017; Huang *et al.* 2021). Past studies that addressed role of those factors are summarized below:

- **structural design.** People examine physical characteristics of urban spaces that they use (Ataç 2007). In particular, quality of architectural and environmental design, as well as functions (e.g., shopping, socialization) influences people's perceived security of that urban space

(Bixler, Floyd 1997). The design and maintenance of the physical environment can positively or negatively impact the security of the visitors (Moos 1976). According to the "broken window" theory, based on the work of Philip Zimbardo, the neglect of a given-area due to indifference is an essential factor that lays the groundwork for crime (Kelling, Wilson 1982). Accordingly, well-maintained areas create the impression of being under control, which positively affects pedestrians' perception of security. Contrarily, poorly maintained areas may encourage crime and create security concerns for visitors (Ceccato, Tcacencu 2018). For this reason, security issues must be resolved to prevent criminal activities, which usually occur in crowded places or dark streets (Berris, Miller 2011). Atkins *et al.* (1991) stated that factors such as sufficient lighting and clear visibility decreases likelihood of criminal activities;

- **planting design.** Whether or not a public space is preferred for any activity is related to how that space is perceived. People who have a negative perception of a public space will be discouraged from visiting the area (Bixler, Floyd 1997). Green spaces in cities provide social and psychological benefits, which are essential to human well-being and quality of life. In such spaces, pedestrian visitors experience recreational opportunities (Parsons, Daniel 2002). Although urban green areas offer various benefits, people's perceived security plays a key role in long-term usage of such spaces (Lyytimäki, Sipilä 2009). For instance, urban green areas that are left untended and neglected can create negative perceptions (Bixler, Floyd 1997; Ulrich 1993). Jansson *et al.* (2013) showed that environmental features such as plant design, maintenance, and plant species has clear effects on perceived security in urban forest areas. Well-designed and well-maintained plant landscape elements increase security perception and appeal of urban spaces and parks. In contrast, scattered, neglected, and contaminated areas create negative perception (Türkseven Doğrusoy, Zengel 2017). Urban open green spaces with a well-designed plant landscape are more desired, while poorly designed urban open green spaces make visitors feel unsafe and are less preferred (Özgüner 2004);

- **visiting frequency.** Overlooking basic principles such as visitor demands, visitor characteristics, and environmental features while designing urban green spaces, may cause negative feelings in visitors such as fear and feeling unsafe (Lyytimäki, Sipilä 2009). Areas that make people feel unsafe may reduce the quality of the recreation experience and may lead to a decrease in pedestrian visiting frequency (Jim, Chen 2006). In their study, Coombes & Viles (2021) concluded that people visit green areas less frequently, if they feel unsafe at such places;

- **crowd perception.** Crowding is a problem that affects people's perception of security in urban spaces (Çelik 2018). Crowded areas are susceptible grounds for crime (Aydın 2010). Criminals prefer crowded places as they are less likely to be caught (Gökulu 2010). People pre-

viously exposed to crime typically are worried when they are alone in an urban space or when they are in a crowded place (Karasu 2021). These individuals worry about their own security, as well as the safety of people who accompany them (Köseoğlu, İçli 2019). Being among people positively increases people's sense of security (Özgüner, Kendle 2006). The belief that people can ask for help from around during an attack may explain this observation (Warr 1990). In research by Aliğaoğlu & Uğur (2021), most survey participants stated that they were not worried about visiting crowded urban spaces. In their study, Arpa & Uğurlar (2019) concluded that crowding of a street was a key factor in route selection of pedestrians;

- **satisfaction with the area.** The primary purpose of urban parks is to provide pedestrians with physical and spiritual rest while enabling integration with nature. Satisfaction measurements of pedestrian visitors' outdoor recreation activities has been the subject of academic studies since 1960s (Baker, Crompton 2000). Urban space satisfaction is a vital variable that significantly affects the desire to revisit urban spaces (Jang, Feng 2007). For this purpose, it is essential to take lessons from successful case studies and applications (Glover 1990). For instance, pedestrian visitors' satisfaction increases in urban spaces that are safe, clean, well-maintained, and easily accessible (Onsekiz, Emür 2008; Stain *et al.* 2012). For comparison, pedestrian visitors' satisfaction decreases in urban spaces that are designed without considering public needs (Chang, Sheppard 2013; Sherman 2005). In his study, Alkan (2019) revealed that the city parks were not safe due to insufficient lighting, which created security concerns for most visitors (90%).

In recent years, various studies investigated visitors perceived security in urban spaces in Turkey. Such studies mainly focused on urban parks or specific neighbourhoods of a city. As examples, Köklü (2016) showed that area-use-status and visitor profiles are among the most important factors that cause a feeling of insecurity among neighbourhood residents in cities. Koca *et al.* (2019) indicated that poor planning and disorder are effective in the formation of crime in urban areas. Bahar & Bilen (2020) noted that the perception of security affects the area preferences of tourists in public spaces in tourism regions. Yazici & Yaslikaya (2021) indicated that the perception of security is one of the critical goals of urban transformation since the perception of security must be maintained for a peaceful urban life. Mihçı & Kaya (2021) found out that the perception of security significantly affects the pedestrian preferences of the area they want to visit. Özden & Yücel Batmaz (2021) stated that the perception of security is an essential component of urban security and quality of urban life. Taşçioğlu (2022) elucidated that the perception of security significantly affects people's housing preferences. Çiftçi (2022) asserted that the perception of security contributes to the quality of urban life and is a factor that affects the identity and branding of the city. Various factors and motivations such as crime create insecurity of

pedestrianized streets (Patil *et al.* 2021). The presence of security officers acts as a deterrent for criminals. A recent study that examined the relationship between walking behaviour and fear of crime revealed that an increased fear of crime serves as a barrier to walking (Foster *et al.* 2014). The built environment plays a role in shaping perceptions of security, and an insecure built environment dissuades people from walking (Adlakha *et al.* 2016). Women and older adults experience a heightened sense of vulnerability and harbor greater security concerns while walking (Foster, Giles-Corti 2008).

As outlined, past studies investigated how security perception influences human behaviour in the context of various urban settings. However, there are 2 main gaps in the current literature about how sociodemographic backgrounds of pedestrians influence the perceived security of visitors: 1 – past studies focused on urban parks and specific neighbourhoods, while limited information is available about perceived security of thoroughfares; 2 – there is limited or no information about how sociodemographic backgrounds of visitors influence their security perceptions of a thoroughfare. Therefore, the aim of this study is to investigate the relationship between the design of pedestrian streets, and the demographic characteristics as well as the urban space usage experiences of pedestrians in the context of perceived security. In simple terms, this study investigates whether or not security perception affects user preferences to visit a main street. For this purpose, we conducted a systematic survey on a main street called Çark Street, located in the city of Sakarya (Turkey). The survey results elucidated whether the perceived security affects pedestrians' preferences in using pedestrian streets and the importance of the perceived security in successful pedestrianization of main streets such as Çark Street. We tested the hypotheses below via this survey:

- **H₁:** the perceived security decreases in crowded places;
- **H₂:** sufficient lighting is the key element that most affects perceived security;
- **H₃:** gender does not affect people's security perception in urban pedestrian areas;
- **H₄:** frequency and duration of visits have an effect on perceived security.

2. Material and methods

2.1. Material

Figure presents a layout of Çark Street, which is a linear pedestrian street connecting Adapazari and Serdivan districts of Sakarya. Çark Street is the most well-known avenue in the city of Sakarya. The street was pedestrianized in early 2000s by the municipality. This street was suitable to investigate reinforcement elements that effect visitors' perceived security. Therefore, Çark Street was selected as the candidate to examine relationship between visitors' preferences and their security perceptions. It is 550 m long, 15...20 m wide and made of stamped concrete paving. Along the east–west direction of the street, there are mag-

nolia trees (*magnolia grandiflora*), lighting poles, small trash cans and direction signs. Figure (view “a”) presents pedestrianization of Çark Street in 2002, while Figure (view “b”) presents a general view of the street, where commercial establishments such as clothing stores, restaurants, technology stores and gift shops are usually located. At the upper floors of the buildings on the street, there are offices of various professional groups (such as doctors, lawyers, accountants), as well as cafes and residences.

The key instruments that affect pedestrians' security perceptions of Çark Street are security cameras, sufficient lighting and crowd density. Accordingly, private, and commercial establishments own and run a total of 170 security cameras that look over the street. Likewise, the municipality has installed 2 long-range cameras that are located at each end of the street. Municipality also installed lamp-posts at every 20 m to provide sufficient lighting. Similarly, commercial establishments provide additional lighting by store lights that are continuous throughout the street.

2.2. Methods

Questionnaire design, sampling, and data collection.

The questionnaire included 3 parts as follows: Part 1 included 3 questions to collect respondent demographic information such as education and income level; Part 2 included 6 questions to find out respondents' reasons to visit Çark Street, as well as the frequency and timing of their visits; Part 3 had 25 questions to investigate pedestrians' security perceptions. Questionnaire components were developed based on preliminary examinations and relevant past findings. As part of our preliminary work, we carried out systematic observations at Çark Street. Specifically, we assessed the street in relevance to its design, constructional/architectural quality, maintenance, activities (e.g., social, economical, and cultural ones), accessibility, and security/safety. As an example, we evaluated security and safety issues by checking for essential instruments such as warning signs, sufficient lighting, security officers, and cameras.

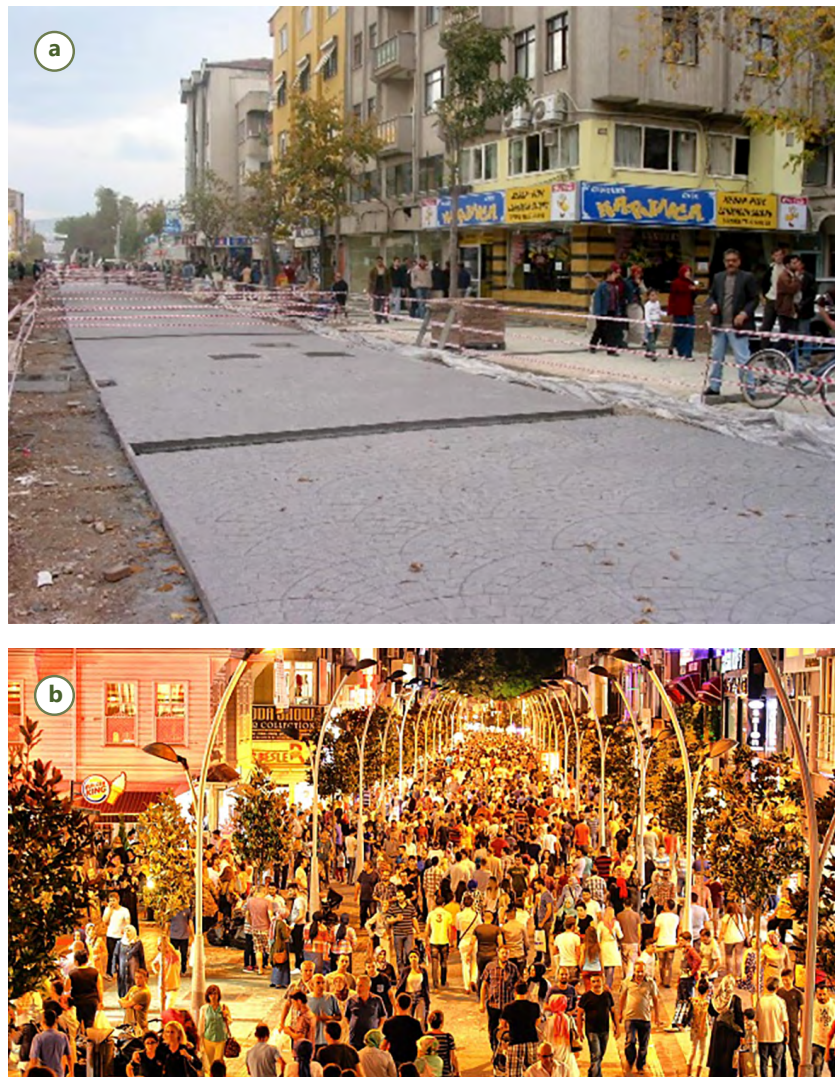


Figure. Çark Street (Sakarya Büyükşehir Belediyesi 2000):

(a) – pedestrianization of Çark Street; (b) – Çark Street general view

Similarly, we studied relevant aspects of the street and had conversations with visitors and owners of small businesses to collect feedback about their security/safety concerns. Next, we reviewed past studies that investigated security issues of urban spaces that were similar to Çark Street. For instance, Schroeder & Anderson (1984) underlined importance of understanding whether perceptual factors such as lighting and crowd density affect the visitor's perception of security. Similarly, several studies highlighted that frequency of visits decreases when visitors feel unsafe due to a decrease in their security perception (Nasar *et al.* 1993; Schroeder & Anderson 1984). In accordance, we defined the survey components based on information that we collected through our field examinations and review of past investigations.

To estimate number of survey participants, number of visitors at Çark Street were quantified at one hour time intervals during morning (e.g., 10:00...11:00 am) and afternoons (e.g., 5:00...6:00 pm), as well as, during 4 seasons. Then, the arithmetic average of the counts was computed, and the values were converted into the number of visitors per day. As a result, it was estimated that the number of visitors would be a maximum of 10000 people per day. Based on this information, the minimum sample size was estimated as 193 with a 95% confidence level and a 7% error rate (Lemeshow *et al.* 1990). Accordingly, 200 independent volunteers were interviewed with demographic backgrounds as presented in Table 1. We made sure that survey participants were representative of a typical visitor population based on their demographics. For instance, Table 1 shows that participants are distributed characteristicly according to their age, education, and income levels.

Table 1. Demographic distribution of survey participants

Demographics	Number of participants, <i>N</i> [-]	Distribution [%]
Gender:	200	100.0
female	67	33.5
male	133	66.5
Age groups:	200	100.0
15...18	30	15.0
19...25	82	41.0
26...35	41	20.5
36...55	35	17.5
>55	12	6.0
Education:	200	100.0
primary	25	12.5
high school	84	42.0
university or above	91	45.5
Income:	200	100.0
low	61	30.5
middle	86	43.0
high	53	26.5

The participants responded to the questions about their security perceptions by using a 5-point Likert scale from 1 (never) to 5 (always). The quota sampling technique was employed to ensure a sufficient number of survey participants and their sociodemographic representation for this study.

To ensure the validity of the survey questions, a focus group comprising 20...40 Çark Street visitors was worked with, and feedback for clarity was obtained. Efforts were made to eliminate any potential bias.

The street's crowd density depends on time and ranges. Because the crowd density is an important factor for security perception, we conducted the survey when the crowd density was low, i.e., from 9:00 am to 12:00 pm, and when it was high, i.e., from 5:00 pm to 9:00 pm. In parallel, we conducted the survey during April, May, June, and November, which represented the time periods that were most suitable to visit this pedestrian street.

3. Results and discussion

Table 2 presents the relative significance of the reason why pedestrians visit Çark Street. Accordingly, the order of key reasons across survey participants (*N* = 200) are: 1 – socialization (38.5%), 2 – shopping (35.0%), 3 – walking and sightseeing (13.0%), 4 – dining (9.5%), and 5 – Relaxation (4.0%). These findings agree with those of past studies suggesting that people typically visit throughfares for socializing and shopping.

For a simple question of whether or not the survey participants find Çark Street secure, 77.6% of the female visitors were positive, while 22.4% were negative. Likewise, 75.0% of male visitors were positive, while 25% were negative about their personal security at Çark Street (Table 3).

Although the rate of female visitors who feel secure on Çark Street is slightly higher than male visitors, this does not mean that there is a statistically significant relationship between gender and perception of security. This may mean that the Çark Street is designed and managed with a female-friendly approach, and thereby, it appeals to both male and female visitors. On this note, Arpa & Uğurlar (2019) found that female visitors feel secure in urban spaces that are used day and night, well-illuminated, and offer functions accessible to both genders. Thus, it is crucial to identify the reasons behind security concerns and prioritize the implementation of measures that promote a sense of security among all pedestrians. In this regard, the key reasons for why visitors perceive Çark Street as secure or insecure were further examined through correlation analysis, as presented in Table 4 and Table 5, respectively.

According to Table 4, the main reasons that influence visitors' security perception are the presence of security officers and other people. In agreement with this observation, past studies indicate that the presence of security guards in urban areas is a factor that makes visitors

feel safe (Aytaç *et al.* 2015). The fact that visitors do not feel alone (crowded) while visiting the street also creates a sense of security. Another significant factor that makes visitors feel safe on Çark Street is that they think that the street is suitable for visiting with family. Hence, people who visit Çark Street with their friends or relatives state that they feel safe.

In parallel, survey participants find the risk of paddy crime (theft) to be low on Çark Street, meaning that they believe that they will not encounter any theft cases during their visit. This perception is caused by a collection of factors such as presence of other people and security guards, lighting, and cameras. The survey results also highlight that sufficient lighting is essential for pedestrians to feel safe during their visit in the evening hours (Table 4, 7th row).

For comparison, the results in Table 5 summarize the factors why visitors feel insecure on Çark Street. People's inherent scepticism towards others (usually, I don't trust strangers), insufficient number of security cameras, and overwhelming crowds (very crowded) are among the top reasons for feeling unsafe at Çark Street. Likewise, a small number of people on the street (there are very few people), darkness (Not possible to visit in the evening), narrow and risky spaces along the street (there are dangerous spaces along the street), as well as the lack of security officers are the main causes of safety concerns for visitors. In this context, Sangster (1996) stated that people's sense of security consists of factors such as an orderly, well-kept, and legible environment, well-lit urban areas, and the presence of other visitors in the area. Andrews (2000) indicated that the risk of encountering situations in which women can be physically or mentally harmed after dark is an accepted idea in most societies. Our findings emphasize the importance of security officers, the presence of demographically-comparable people, sufficient lighting, and security cameras to ensure visitor security on throughfares.

The answers to the question "Is Çark Street secure?" were compared with the demographic characteristics of the visitors. Multiple-correlation analysis was conducted to understand the relationship between visitors' demographics and their security perception. Table 6 presents the findings of this analysis. Accordingly, there is no significant relationship between visitor gender, age, education, income, and means of arrival versus their security perception. On the other hand, the key factors that influence visitors' security perception are associated with their visiting style, the frequency of visit, and the arrival distance. Specifically, security perception decreases for those who visit the main street alone, whereas people visiting with their friends, family or both feel secure. According to West & Merriam (1970), individuals get along better with their family members in outdoor places. Korkut (2015) indicated that the suitability of parks and urban spaces for families is a fundamental security criterion and is effective in usage. In a similar study, Atabeyoğlu & Ayhan (2020) stated

that visiting a park with family or friends increases each individual's feeling of security. Çetinkaya *et al.* (2016) stated that people who visit a park with friends have a high level of satisfaction, and thereby, frequency and duration of their visits increases.

Interestingly, a significant relationship between the arrival distance of pedestrians and their perception of security was found (Table 6, last row). Korkut (2015) indicated that one of the reasons for why visitors feel insecure in parks is the distance from the location they live in.

Table 2. Purpose of pedestrians visit Çark Street

Priority order	Purpose of visit	Distribution [%]
1	socializing	38.5
2	shopping	35.0
3	walking	13.0
4	dining	9.5
5	relaxation	4.0

Table 3. Security perceptions of visitors on Çark Street

Gender	Is the street secure? [%]		Total [%]
	secure	insecure	
Female	77.6	22.4	100.0
Male	75.0	25.0	100.0
Total	76.0	24.0	100.0

Table 4. Order of factors that influence pedestrians' security perceptions positively (safe) on Çark Street

Factor	Relative importance (mean)
There are security officers	4.48
Crowded	4.24
Suitable for families	3.84
Visiting with a friend or a relative	3.78
Paddy crime (theft) risk is low	3.76
Possible to visit in the evening (sufficient lighting)	3.45
I am with my family members	2.15

Table 5. Order of factors that influence pedestrians' security perceptions negatively (unsafe) on Çark Street

Factor	Relative importance (mean)
Usually, I don't trust strangers	4.60
Number of security cameras are insufficient	4.49
Very crowded	4.24
There are very few people	3.78
There are dangerous spaces along the street	3.77
Not possible to visit in the evening (insufficient lighting)	3.45
There are no security officers around	3.34

In agreement, our findings indicate that people who travel long distances to visit an urban place feel insecure. The most likely cause for this outcome is that the visitor feels distant from his/her neighbourhood.

For further assessment, multiple-correlation analysis was carried out between visitors' demographics and various factors that influence security perceptions. Table 7 shows the results for factors that make visitors feel secure, whereas Table 8 presents the results for factors that make visitors feel insecure at Çark Street.

Table 6. Results of multi-correlation analysis between visitor demographics and their security perceptions

Demographics	Pearson	Significance
Gender	0.02	0.70
Age	0.06	0.38
Education level	-0.02	0.75
Income level	-0.05	0.45
Means of arrival	-0.025	0.722
Visiting style (single, or with family or friends)	-0.14*	0.03
Frequency of visits	0.23**	0.001
Duration of visit	0.04	0.53
Arrival distance	0.15*	0.027

Notes: * $p \leq 0.05$; ** $p \leq 0.001$;

Perception of security: 1 – secure, 2 – insecure;

Gender: 1 – female, 2 – male;

Age: 1 – 15...18, 2 – 19...25, 3 – 26...35, 4 – 36...55, 5 – 55+;

Education: 1 – no literacy, 2 – primary, 3 – high school, 4 – undergraduate, 5 – undergraduate+;

Income: 1 – low, 2 – middle, 3 – high;

Visiting style 1 – alone, 2 – with friends, 3 – with family, 4 – with family and friends;

Frequency of visits: 1 – daily, 2 – 1...2 per week, 3 – 1...2 or less per month.

According to Table 7, there is a significant relationship between gender and the time of their visit (possible to visit in the evening). The results indicate that female visitors typically avoid public places in the evening hours. According to Andrews (2000), this situation is related to the risk of encountering situations in which females may be physically or mentally harmed in the dark, which is an accepted concept in many societies. This finding aligns well with those of past studies.

Similarly, there is a significant relationship between age and visiting style (I am with my family members). In this sense, our personal communications with visitors indicated that mature adults (age group: 36...55) prefer an urban place where they can spend time with their families and children during their visits. Çetinkaya *et al.* (2016) reached a similar finding that most people prefer public places that are suitable for families. This factor must be integrated in the design of urban spaces, parks, and pedestrian shopping streets.

The findings also indicate that there is no significant relationship between education and income levels versus people's security perceptions.

For comparison, there is a significant relationship between how much time visitors spend versus their perceived security (Table 7, 5th row, 3rd–5th columns). In general, the factor that cause feeling of security include 1 – visiting with a family member or a friend ($p \leq 0.001$), 2 – the street is crowded, 3 – the street is suitable for families ($p \leq 0.05$), and 4 – presence of security officers and cameras around. Thus, they spend more time (>1 h) in the area. The fact that people can perform many activities together in urban spaces allows them to spend more time in the urban space and be satisfied (Lee 2007). While the quality of urban spaces increases public's satisfaction, it also positively contributes to the security perception (Hinkle 2014). Moreover, individuals build stronger bonds with their families

Table 7. The factors that make visitors feel secure

Factors		There are security officers	Crowded	Suitable for families	Visiting with a friend or a relative	Paddy crime (theft) risk is low	Possible to visit in the evening	I am with my family members
Gender	Pearson	-0.017	-0.068	0.064	-0.061	0.308**	0.717**	0.016
	significance	0.833	0.403	0.434	0.424	0.000	0.000	0.846
Age	Pearson	-0.004	0.085	0.466**	0.143	0.058	-0.043	0.381**
	significance	0.958	0.300	0.000	0.078	0.479	0.597	0.000
Education level	Pearson	-0.023	0.057	0.145	0.004	-0.084	0.002	0.061
	significance	0.781	0.483	0.076	0.957	0.304	0.979	0.457
Income level	Pearson	0.112	0.039	0.145	0.057	0.112	0.097	0.188
	significance	0.169	0.630	0.074	0.484	0.171	0.273	0.020
Duration of visit	Pearson	0.166*	0.172*	0.194*	0.286**	-0.129	-0.131	0.311**
	significance	0.041	0.034	0.016	0.000	0.113	0.109	0.000
Have you had injury?	Pearson	-0.030	-0.012	0.068	-0.030	-0.160*	-0.039	0.090
	significance	0.716	0.883	0.409	0.716	0.049	0.634	0.272
Have you witnessed a forensic case?	Pearson	0.014	0.006	0.055	0.068	-0.163*	-0.146	0.046
	significance	0.863	0.944	0.498	0.402	0.045	0.073	0.577

Notes: * $p \leq 0.05$; ** $p \leq 0.001$.

Table 8. The factors that make visitors feel insecure

Factors		Usually, I don't trust strangers	Number of Closed-Circuit Television (CCTV) are insufficient	Very crowded	There are very few people	There are dangerous spaces along the street	There are dangerous people around	Not possible to visit in the evening	There are no security officers around
Demographics									
Gender	Pearson	−0.189	−0.187	−0.138	−0.055	−0.043	−0.209	0.091	−0.176
	significance	0.204	0.209	0.356	0.716	0.777	0.159	0.543	0.237
Age	Pearson	−0.062	−0.111	0.120	−0.132	0.013	0.269	0.154	−0.061
	significance	0.678	0.459	0.422	0.376	0.933	0.068	0.303	0.683
Education level	Pearson	−0.061	0.166	0.217	0.018	−0.120	−0.196	−0.011	0.163
	significance	0.686	0.264	0.143	0.905	0.421	0.186	0.942	0.275
Income level	Pearson	−0.294*	−0.077	0.063	−0.097	0.220	0.286	0.350*	−0.077
	significance	0.045*	0.605	0.675	0.517	0.137	0.051	0.016*	0.606
Duration of visit	Pearson	−0.007	−0.005	0.178	−0.151	0.337*	0.219	0.158	−0.024
	significance	0.962	0.971	0.231	0.311	0.021	0.138	0.289	0.871
Have you had injury?	Pearson	−0.122	0.224	−0.284	0.063	0.141	0.160	0.047	0.239
	significance	0.412	0.131	0.053	0.675	0.345	0.284	0.752	0.105
Have you witnessed a forensic case?	Pearson	−0.211	0.121	−0.062	0.315*	0.001	−0.142	0.129	0.117
	significance	0.155	0.417	0.678	0.031	0.993	0.341	0.388	0.434

Notes: * $p \leq 0.05$;

Gender: 1 – female, 2 – male;

Age: 1 – 15...18, 2 – 19...25, 3 – 26...35, 4 – 36...55, 5 – 55+;

Education: 1 – no literacy, 2 – primary, 3 – high school, 4 – undergraduate, 5 – undergraduate+;

Income: 1 – low, 2 – middle, 3 – high;

Duration of visit: 1 – less than 1 h, 2 – 1...2 h, 3 – 3...4+ h;

Injury: 1 – yes, 2 – no;

Forensic case: 1 – yes, 2 – no;

Factors: 1 – definitely no, 5 – definitely yes.

in outdoor settings, which fosters enhanced intrafamilial communication (West, Merriam 1970).

According to the findings in Table 8, there is no significant relationship between gender, age, and education levels versus the factors that make visitors feel insecure. Interestingly, there is a direct relationship between the income levels of the pedestrians and the inadequacy of the street lighting. Lighting is insufficient (not possible to visit in the evening) for high-income pedestrians. As income decreases, distrust towards the people around increases (Usually, I don't trust strangers), which also triggers fear of crime. According to pedestrians who spend more time on Çark Street, the presence of dangerous areas makes them feel insecure. There is an inversely proportional relationship between the dangerous spaces along the street and feeling of insecurity. Improper planting design, a limited view in the area, and trap areas are among the reasons for this perception. Pedestrians who have witnessed a crime event are concerned about their security, especially when a small number of people are present in the thoroughfare. The key reason for this attitude is that criminals are reluctant to commit crimes when there are many people who can see or interfere. Hence, criminals prefer secluded places such as a dark alley to commit their crime (Cicalali, E. E., Cicalali, L. K. 2016). In a study by Aytaç *et al.* (2015), the rate of people avoiding walking alone in secluded places

in 2010 was 43% in Russia, 34% in Norway, and 35% in England. This is because secluded spaces have the potential to harbor criminals and carry significant potential for committing crime. People's perceptions of safety and security are frequently influenced by the perceived risks in urban environments (Lee *et al.* 2017). These feelings may differ significantly and may not necessarily correspond to the factual prevalence of crime or hazards in a particular location. Nevertheless, it's crucial to acknowledge that perceived threats in urban areas can be linked to real issues and a sense of insecurity (Zhang *et al.* 2021). Several factors, including the physical and social attributes of the surroundings, personal experiences, biases, media depictions of crime, and demographic elements, can contribute to this correlation (Dietz 1997).

The factors that affect visitors' security perceptions at most according to their demographics are summarized in Table 9. As an example, based on the factors that make visitors feel secure, there is statistically meaningful relationship between "possible to visit in the evening" and "gender" (Table 9, 1st row). Likewise, based on the factors that make visitors feel insecure, there is statistically meaningful relationship between "not possible to visit in the evening" and "income level".

Participants who felt secure at Çark Street were further asked whether they were satisfied with the area and

whether they would recommend it to others. Participants responded to these queries with "I am happy with the area" and "I recommend it to others". The responses were scaled as 1 (never) and 5 (always) according to Likert scale. Then, a correlation analysis was conducted to assess the relationship between the factors contributing to pedestrians' security perceptions and their satisfaction with the area, as well as whether they recommend the area to others. The results of this analysis are presented in Table 10.

According to the values in Table 10, the security perception is correlated with the factors including: 1 – being crowded ($p \leq 0.001$), 2 – not visiting alone ($p \leq 0.05$), 3 – the presence of a security guard ($p \leq 0.001$), and 4 – lack of paddy crime (theft) ($p \leq 0.01$). Likewise, the pedestrians who find Çark Street secure recommend the area to others for the same reasons: It is crowded ($p \leq 0.001$), there is a security guard in the area ($p \leq 0.01$), it can be visited in the evening ($p \leq 0.001$) and there is no paddy theft ($p \leq 0.01$).

In this sense, law enforcement officers, municipal officials, and private security elements on Çark Street contribute to pedestrian satisfaction. In addition, pedestrians who find the street secure can recommend the area to other pedestrians more readily for the reasons summarized above. Pedestrians' preferences for urban spaces may vary depending on various factors such as lighting, secu-

rity, and variety of activities (Aksoy, Akpınar 2011). Parks with adequate lighting and security are also used in the evening (Güngör, Çakın 2021). It can be thought that the suitability factor for evening use, which positively affects the satisfaction of Çark Street pedestrians, is related to the adequacy of the facilities to be used in the evening hours, e.g., the area is well-lit and presence of security guards. In this context, it is essential to evaluate functions and activities that will allow evening and night use in the design processes of urban spaces. Recent studies have determined that the crowd positively contributes to satisfaction (Bingül Bulut, Yulu 2022; Müderrisoğlu 2002).

No relationship was found between pedestrians' satisfaction with the area and visiting the area with their families. In addition, there was no significant change in the satisfaction of pedestrians who think the area suits families. However, Çetinkaya *et al.* (2016) found that the satisfaction levels of pedestrians who visit a park with their families were higher than those who visited alone. As a result, pedestrians already feel secure at a certain level when they visit the area with their families.

Overall, perceived security is an important factor in choosing pedestrian areas in cities. Hence, the perceived security must be considered as a criterion for successful pedestrianization efforts.

Table 9. The Factors that make visitors feel most secure/insecure according to their demographics

Demographics	Secure					Insecure	
Gender	Paddy crime (theft) risk is low	Possible to visit in the evening					
Age	Suitable for families	I am with my family members					
Income level						Usually, I don't trust strangers	Not possible to visit in the evening
Duration of visit	There are security officers	Crowded	Suitable for families	Visiting with a friend or a relative	I am with my family members	There are dangerous spaces along the street	
Have you had injury	Paddy crime (theft) risk is low						
Have you witnessed a forensic case	Paddy crime (theft) risk is low					There are very few people	

Table 10. The relationship between factors that make visitors feel secure and their satisfaction levels

Factors that influence security perception	Satisfied		Recommend to others	
	Pearson	significance	Pearson	significance
Crowded	0.270***	0.001	0.250**	0.002
Not being alone	0.160*	0.040	0.130	0.090
Visited with family	0.082	0.310	0.060	0.440
Suitable for families	-0.030	0.690	-0.050	0.530
Presence of security officers	0.440***	0.000	0.470***	0.000
Can visit during the evening hours	0.320***	0.000	0.310***	0.000
Paddy crime (theft) is absent	0.240**	0.002	0.240**	0.002

Notes: * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

4. Evaluation of research hypotheses

H₁: the perception of security decreases in crowded places. Typically, people's security perception of a main street relies on the number and type of people that are present on the street. In particular, scarcity of visitors might trigger unsafe feelings, while moderate to normal crowds may lead to feeling secure, and overcrowding (feeling jammed) may cause feelings of insecurity. To test this hypothesis, participants were questioned about their perception of security on Çark Street and the factors that influenced their security perceptions. Pedestrians who felt secure on Çark Street, indicated that a normal crowd was the key factor, and this had a significant impact (4.24) on their security perception. For comparison, pedestrians who felt insecure noted that the presence of untrustworthy individuals in the crowd and their personal lack of trust in others were the factors for why they felt insecure (3.95). These findings do not support our hypothesis that the security perception decreases in crowded places. In contrast, a normal level of pedestrian traffic in the area is a key factor for feeling secure and secure.

H₂: sufficient lighting is the key element that most affects security the perception. It is clear that sufficient lighting has positive effects on the security perception of pedestrians in any urban setting. However, whether or not this is the most important element that affects the security perception is uncertain. According to the survey results, insufficient lighting has low importance as a reason for feeling insecure. Likewise, sufficient lighting is moderately important for those participants who noted "I visit in the evening". Hence, the results did not support the hypothesis that sufficient lighting is the most influential element in people's security perception.

H₃: gender does not affect people's security perception in urban pedestrian areas. A typical pedestrian, female or male, visits a throughfare for reasons such as shopping and socialization. These activities usually require minimal cognitive effort to check for security of that environment. Hence, gender should be trivial in the context of security perception. Accordingly, our results indicate that the rate of female pedestrians who feel secure when visiting Çark Street is 77.6%, while this ratio is 75% for male pedestrians. These values highlight that gender has no effect on security perception of pedestrians. In support of this finding, no statistical relationship was found between gender and perception of security (significance: 0.70) (Sakarya Büyükşehir Belediyesi 2000). Although there is no statistical difference in the perception of security between female and male pedestrians, this is relevant to daytime use of the street. The findings indicate that female pedestrians have security concerns for visiting Çark Street at night. As a result, security perception does not depend on gender in urban setting, but female visitors have security concerns for their visit at late hours. Overall, the survey results confirmed this research hypothesis.

H₄: frequency and duration of visits have an effect on security perception. When people visit a main street frequently, and they spend a considerable amount of time during each visit, their security perception about that street increases over time. Accordingly, the survey results show that people's security perception of Çark Street increases along with frequency of visits to the area. However, the results indicate that security perception is independent of the time period that a pedestrian spends on Çark Street. Hence, the results partially support the hypothesis.

5. Conclusions

The findings indicate that most pedestrians (female or male) feel secure about visiting Çark Street during the daytime, while female pedestrians have security concerns for their visits at night. To improve this situation, sufficient lighting is essential. While designing such lighting, a key point is to ensure that there are no dark and dangerous areas that reduce visibility and encourage crime.

Concomitantly, the current pedestrian density of Çark Street positively affects pedestrians' security perception, and their satisfaction level associated with the area. For this reason, survey participants, who feel secure with a crowd, noted that they recommend the area to others. For comparison, the critical factors that caused pedestrians to feel insecure on Çark Street are "the presence of people who seem dangerous" and general distrust in other people. To eliminate such concerns, pedestrian security can be supported by the presence of security guards and law enforcement agents. Likewise, installing security cameras and facial recognition systems will help law enforcement and security officers to detect and respond to criminals in urban pedestrian areas before any crime happens.

In the context of reducing crime, designers must ensure that the width and length of the street is reasonable. Simply, pedestrians should be able to seek help quickly from those around them, or from security guards in their vicinity. In this sense, the width and length of secure pedestrian streets must be rationalized. Similarly, when designing pedestrian areas, there should be meeting points where pedestrians can meet and move along with their activities. Meeting points can increase the usability and security of the street. In parallel, sufficient space for pedestrians to roam freely is an essential component of pedestrian areas.

On another note, the findings suggest that security perception decreases as the distance from a pedestrian's house to the main street increases. This is because pedestrians feel secure in places closer to their homes. In this context, a clear suggestion for designing pedestrian areas is that they should be close to residential areas and/or accessible by public transport in a short time.

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Declaration on the use of Artificial Intelligence (AI)

During the preparation of this manuscript, the authors did not use generative AI or AI-assisted technologies.

The authors take full responsibility for the content of this manuscript.

References

- Adlakha, D.; Hipp, J. A.; Brownson, R. C. 2016. Neighborhood-based differences in walkability, physical activity, and weight status in India, *Journal of Transport & Health* 3(4): 485–499. <https://doi.org/10.1016/j.jth.2016.10.008>
- Affleck, R. T.; Gardner, K.; Aytur, S.; Carlson, C.; Grimm, C.; Deeb, E. 2019. sustainable infrastructure in conflict zones: police facilities' impact on perception of safety in Afghan communities, *Sustainability* 11(7): 2113. <https://doi.org/10.3390/su11072113>
- Aksoy, Y.; Akpınar, A. 2011. Yeşil alan kullanımı ve yeşil alan gereksinimi üzerine bir araştırma İstanbul ili Fatih ilçesi örneği, *İstanbul Ticaret Üniversitesi Fen Bilimleri Dergisi* 10(20): 81–96. Available from Internet: <https://izlik.org/JA85CZ65MB> (in Turkish).
- Aliağaoğlu, A.; Uğur, A. 2021. Kentlerde suç ve suça iten sebepler, suçla ilgili teorik çalışmalar, *Doğu Coğrafya Dergisi* 26(45): 37–54. <https://doi.org/10.17295/ataunidcd.877000> (in Turkish).
- Alkan, Y. 2019. Kent parklarının kullanıcı memnuniyeti açısından irdelenmesi: Çanakkale örneği, *Kent Akademisi* 12(3): 519–530. <https://doi.org/10.35674/kent.592271> (in Turkish).
- Andrews, W. C. 2000. Approaches to taking a sexual history, *Journal of Women's Health & Gender-Based Medicine* 9(1 Suppl.): S21–S24. <https://doi.org/10.1089/152460900318821>
- Apak, S.; Ülken, G.; Ünlü, A. 2002. Yeni bir toplu konut yerleşmesinde "güvenlik duygusunun" değerlendirilmesi, *İTÜ Dergisi A: Mimarlık, Planlama, Tasarım* 1(1): 65–72. Available from Internet: http://itudergi.itu.edu.tr/index.php/itudergisi_a/article/viewFile/985/890 (in Turkish).
- Arpa, E.; Uğurlar, A. 2019. Suç ve mekan bağlamında güven algısı: Van örneği, *Sosyal Bilimler Enstitüsü Dergisi* (44): 293–323. Available from Internet: <https://izlik.org/JA66LF33NG> (in Turkish).
- Atabeyoğlu, Ö.; Ayhan, A. 2020. Giresun kenti parklarında kullanıcı memnuniyeti, *Kent Akademisi* 13(2): 305–314. <https://doi.org/10.35674/kent.722367> (in Turkish).
- Ataç, E. 2007. Suçun kentsel mekandaki algısı : güvensizlik hissi, *Dosya: TMMOB Mimarlar Odası Ankara Şubesi* 55(6): 16–23. (in Turkish).
- Atkins, S.; Husain, M. S.; Storey, A. 1991. *The Influence of Street Lighting on Crime and Fear of Crime*. Crime Prevention Unit Paper No 28. Home Office Crime Prevention Unit, London, UK. 67 p.
- Aydın, M. A. 2010. *Kentsel Mekan, Suç ve Suçluluk; Kadıköy Örneği*. Yüksek Lisans Tezi. İstanbul Üniversitesi, İstanbul, Türkiye. 161 s. (in Turkish).
- Aytaç, S.; Derdiman, R. C.; Baştürk, Ş.; Öngen, B. 2015. Kent güvenliği olarak suç korkusu: Bursa örneği, *Mühendislik Bilimleri ve Tasarım Dergisi* 3(3): 259–267. Available from Internet: <https://izlik.org/JA34UY43RT> (in Turkish).
- Bahar, O.; Bilen, K. 2020. Turizmde güvenlik algısının Türkiye ekonomisine etkisi, *Güvenlik Bilimleri Dergisi* (Özel Sayı): 185–206. <https://doi.org/10.28956/gbd.696020> (in Turkish).
- Baker, D. A.; Crompton, J. L. 2000. Quality, satisfaction and behavioral intentions, *Annals of Tourism Research* 27(3): 785–804. [https://doi.org/10.1016/S0160-7383\(99\)00108-5](https://doi.org/10.1016/S0160-7383(99)00108-5)
- Bedimo-Rung, A. L. Mowen, A. J.; Cohen, D. A. 2005. The significance of parks to physical activity and public health: a conceptual model, *American Journal of Preventive Medicine* 28(2): 159–168. <https://doi.org/10.1016/j.amepre.2004.10.024>
- Berris, R.; Miller, E. 2011. How design of the physical environment impacts on early learning: educators' and parents' perspectives, *Australasian Journal of Early Childhood* 36(4): 102–110. <https://doi.org/10.1177/183693911103600414>
- Bingül Bulut, M. B.; Yulu, A. 2022. Ağrı dağı milli parkı'nda rekreasyonel faaliyetlerin etkileri üzerine ziyaretçi görüşlerinin değerlendirilmesi, *Türkiye Peyzaj Araştırmaları Dergisi* 5(1): 43–52. <https://doi.org/10.51552/peyad.1131018> (in Turkish).
- Bixler, R. D.; Floyd, M. F. 1997. Nature is scary, disgusting, and uncomfortable, *Environment and Behavior* 29(4): 443–467. <https://doi.org/10.1177/001391659702900401>
- Ceccato, V.; Tcacencu, S. 2018. Perceived safety in a shopping centre: a Swedish case study, in V. Ceccato, R. Armitage (Eds). *Retail Crime: Crime Prevention and Security Management*, 215–242. https://doi.org/10.1007/978-3-319-73065-3_9
- Çelik, F. 2018. Kentsel açık-yeşil alanlarda güvenlik, *İdealkent* 9(23): 58–94. <https://doi.org/10.31198/idealkent.416257> (in Turkish).
- Çetinkaya, G.; Yıldız, M.; Özçelik, M. A. 2016. Açık hava rekreasyon kapsamında milli park kullanım engelleri, *Mediterranean Journal of Humanities* 6(1): 99–114. Available from Internet: <https://izlik.org/JA86AC82KW> (in Turkish).
- Chang, I.-C. C.; Sheppard, E. 2013. China's eco-cities as variegated urban sustainability: Dongtan eco-city and Chongming eco-island, *Journal of Urban Technology* 20(1): 57–75. <https://doi.org/10.1080/10630732.2012.735104>
- Cicerale, E. E.; Cicerale, L. K. 2016. Çevre ve suç: şehir güvenliğini artırmada çevre psikoloji yaklaşımı, içinde *İstanbul Güvenlik Konferansı 2016 "Devlet Doğasının Değişimi: Güvenliğin Sınırları"*, 2–4 kasım 2016, İstanbul, Türkiye, 1–12. (in Turkish).
- Coombes, M. A.; Viles, H. A. 2021. Integrating nature-based solutions and the conservation of urban built heritage: challenges, opportunities, and prospects, *Urban Forestry & Urban Greening* 63: 127192. <https://doi.org/10.1016/j.ufug.2021.127192>
- Çiftçi, A. O. 2022. *Marka Kent Oluşturma Stratejileri: Selçuklu Bel-ediyesi Örneği*. Yüksek Lisans Tezi. Karamanoğlu Mehmet Bey Üniversitesi, Karaman, Türkiye. 98 s. (in Turkish).

- Dietz, A. S. 1997. Evaluating community policing: quality police service and fear of crime, *Policing: an International Journal* 20(1): 83–100. <https://doi.org/10.1108/13639519710162024>
- Foster, S.; Giles-Corti, B. 2008. The built environment, neighborhood crime and constrained physical activity: An exploration of inconsistent findings, *Preventive Medicine* 47(3): 241–251. <https://doi.org/10.1016/j.ypmed.2008.03.017>
- Foster, S.; Villanueva, K.; Wood, L.; Christian, H.; Giles-Corti, B. 2014. The impact of parents' fear of strangers and perceptions of informal social control on children's independent mobility, *Health & Place* 26: 60–68. <https://doi.org/10.1016/j.healthplace.2013.11.006>
- Glover, F. 1990. Tabu search: a tutorial, *Interfaces* 20(4): 74–94. <https://doi.org/10.1287/inte.20.4.74>
- Gökulu, G. 2010. Kent güvenliği kentleşme ve suç ilişkisi, *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi* 24(1): 209–226. Available from Internet: <https://izlik.org/JA66KR39GR> (in Turkish).
- Güngör, S.; Çakın, M. 2021. Kent parklarında kullanıcı tercihlerinin değerlendirilmesi "Kyoto japon parkı ve Kalehan-Ecdat parkı" Örneği, *Avrupa Bilim ve Teknoloji Dergisi* 28: 362–367. <https://doi.org/10.31590/ejosat.1000190> (in Turkish).
- Hinkle, J. C. 2014. Broken windows thesis, in *Encyclopedia of Criminology and Criminal Justice*, 213–223. https://doi.org/10.1007/978-1-4614-5690-2_14
- Huang, W.; Luo, M.; Zhang, P.; Zha, Y. 2021. Full-scaled deep metric learning for pedestrian re-identification, *Multimedia Tools and Applications* 80: 5945–5975. <https://doi.org/10.1007/s11042-020-09997-x>
- Jabbari, M.; Fonseca, F.; Smith, G.; Conticelli, E.; Tondelli, S.; Ribeiro, P.; Ahmadi, Z.; Papageorgiou, G.; Ramos, R. 2023. The pedestrian network concept: a systematic literature review, *Journal of Urban Mobility* 3: 100051. <https://doi.org/10.1016/j.urbmob.2023.100051>
- Jang, S.; Feng, R. 2007. Temporal destination revisit intention: the effects of novelty seeking and satisfaction. *Tourism Management* 28(2): 580–590. <https://doi.org/10.1016/j.tourman.2006.04.024>
- Jansson, M.; Fors, H.; Lindgren, T.; Wiström, B. 2013. Perceived personal safety in relation to urban woodland vegetation – a review, *Urban Forestry & Urban Greening* 12(2): 127–133. <https://doi.org/10.1016/j.ufug.2013.01.005>
- Jim, C. Y.; Chen, W. Y. 2006. Impacts of urban environmental elements on residential housing prices in Guangzhou (China), *Landscape and Urban Planning* 78(4): 422–434. <https://doi.org/10.1016/j.landurbplan.2005.12.003>
- Johnston, M.; Shimada, L. D. 2004. Urban forestry in a multicultural society, *Journal of Arboriculture* 30(3): 185–192. <https://doi.org/10.48044/jauf.2004.023>
- Karasu, M. A. 2021. Kentin eğreti sakinleri: göçmenler, içinde S. E. Kavanoz, A. Uzun, H. Şengün (Eds.). *Karmaşık Sorular ve Kent 1*: 169–188. (in Turkish).
- Kelling, G. L.; Wilson, J. Q. 1982. Broken windows: the police and neighborhood safety, *The Atlantic* (3): 29–38. Available from Internet: <https://www.theatlantic.com/magazine/archive/1982/03/broken-windows/304465/>
- Koca, T.; Çolpan Erkan, N. 2019. Yaşam kalitesinin artırılmasında bir etmen: mekânsal güvenlik ölçütleri, *Megaron / Yıldız Technical University Faculty of Architecture E-Journal* 14(1): 167–176. <https://doi.org/10.5505/megaron.2018.18942> (in Turkish).
- Köklü, E. 2016. *Kent Merkezlerinde Suç Korkusunun İncelenmesi: Beşiktaş Örneği*. Yüksek Lisans Tezi. İstanbul Teknik Üniversitesi. İstanbul, Türkiye. 141 s. Available from Internet: <http://hdl.handle.net/11527/16103> (in Turkish).
- Korkut, A. 2015. *Kentsel Park ve Yeşil Alanlara Yönelik Kent Halkının Algısı ve Tutumu: İstanbul, Tekirdağ, Kırklareli Örneği*. Araştırma projesi. Tekirdağ Namık Kemal Üniversitesi, Türkiye. (in Turkish).
- Köseoğlu, M.; İçli, T. 2019. Kadınlarda suç korkusunun çeşitli değişkenler açısından değerlendirilmesi: Kuzey Kıbrıs örneği, *Sosyal Politika Çalışmaları Dergisi* 19(43): 267–295. <https://doi.org/10.21560/spcd.v19i46288.480377> (in Turkish).
- Lam, A. H.-S. 1989. *The Impact of Street Landscape Quality on Urban Land Value: a Case Study in Cambridge, Massachusetts*. Dissertation. Harvard University, Cambridge, MA, US. 122 p.
- Lee, E. H.; Christopoulos, G. I.; Kwok, K. W.; Roberts, A. C.; Soh, C.-K. 2017. A psychosocial approach to understanding underground spaces, *Frontiers in Psychology* 8: 452. <https://doi.org/10.3389/fpsyg.2017.00452>
- Lee, T. H. 2007. An ecotourism behavioural model of national forest recreation areas in Taiwan, *International Forestry Review* 9(3): 771–785. <https://doi.org/10.1505/ifer.9.3.771>
- Lemeshow, S.; Hosmer, D. W.; Klar, J.; Lwanga, S. K. 1990. *Adequacy of Sample Size in Health Studies*. Wiley. 252 p.
- Loewen, L. J.; Steel, G. D.; Suedfeld, P. 1993. Perceived safety from crime in the urban environment, *Journal of Environmental Psychology* 13(4): 323–331. [https://doi.org/10.1016/S0272-4944\(05\)80254-3](https://doi.org/10.1016/S0272-4944(05)80254-3)
- Lyytimäki, J.; Sipilä, M. 2009. Hopping on one leg – the challenge of ecosystem disservices for urban green management, *Urban Forestry & Urban Greening* 8(4): 309–315. <https://doi.org/10.1016/j.ufug.2009.09.003>
- Madge, C. 1997. Public parks and the geography of fear, *Tijdschrift voor Economische en Sociale Geografie* 88(3): 237–250. <https://doi.org/10.1111/j.1467-9663.1997.tb01601.x>
- Mihçı, Z.; Kaya, A. 2021. Yürünebilirliğin nitel ve nicel veriler üzerinden ölçülmesi; Düzce örneği, *Düzce Üniversitesi Bilim ve Teknoloji Dergisi* 9(4): 1242–1266. <https://doi.org/10.29130/dubited.844165> (in Turkish).
- Moos, R. H. 1976. *The Human Context: Environmental Determinants of Behavior*. John Wiley & Sons. 444 p.
- Müderrişoğlu, H. 2002. Mekanda kalabalık algısı ve kullanıcı memnuniyeti, *İstanbul Üniversitesi Orman Fakültesi Dergisi – Seri B* 52(1): 125–132. Available from Internet: <https://izlik.org/JA59TW33BZ> (in Turkish).
- Müderrişoğlu, H.; Demir, Z. 2004. The relationship between perceived beauty and safety in urban recreation parks, *Journal of Applied Sciences* 4(1): 72–77. <https://doi.org/10.3923/jas.2004.72.77>
- Nasar, J. L.; Fisher, B.; Grannis, M. 1993. Proximate physical cues to fear of crime, *Landscape and Urban Planning* 26(1–4): 161–178. [https://doi.org/10.1016/0169-2046\(93\)90014-5](https://doi.org/10.1016/0169-2046(93)90014-5)
- Onsekiz, D.; Emür, S. H. 2008. Kent parklarında kullanıcı tercihleri ve değerlendirme ölçütlerinin belirlenmesi, *Sosyal Bilimler Enstitüsü Dergisi* 24(1): 69–104. Available from Internet: <https://izlik.org/JA78KK48YL> (in Turkish).
- Özden, E.; Yücel Batmaz, N. 2021. Türkiye'de kentsel yaşam kalitesi üzerine literatür değerlendirmesi, *Türkiye Sosyal Araştırmalar Dergisi* 26(1): 45–65. Available from Internet: <https://izlik.org/JA43ZK38ZA> (in Turkish).
- Özgüner, H. 2004. Doğal peyzajın insanların psikolojik ve fiziksel sağlığı üzerine etkileri, *Süleyman Demirel Üniversitesi Orman Fakültesi Dergisi. Seri: A, Sayı 5*(2): 97–107. Available from Internet: <https://izlik.org/JA35ZZ23ZY> (in Turkish).
- Özgüner, H.; Kendle, A. D. 2006. Public attitudes towards naturalistic versus designed landscapes in the city of Sheffield (UK), *Landscape and Urban Planning* 74(2): 139–157. <https://doi.org/10.1016/j.landurbplan.2004.10.003>

- Painter, K. 1996. The influence of street lighting improvements on crime, fear and pedestrian street use, after dark, *Landscape and Urban Planning* 35(2-3): 193-201.
[https://doi.org/10.1016/0169-2046\(96\)00311-8](https://doi.org/10.1016/0169-2046(96)00311-8)
- Parsons, R.; Daniel, T. C. 2002. Good looking: in defense of scenic landscape aesthetics, *Landscape and Urban Planning* 60(1): 43-56. [https://doi.org/10.1016/S0169-2046\(02\)00051-8](https://doi.org/10.1016/S0169-2046(02)00051-8)
- Patil, M.; Majumdar, B. B.; Sahu, P. K. 2021. Evaluating pedestrian crash-prone locations to formulate policy interventions for improved safety and walkability at sidewalks and crosswalks, *Transportation Research Record: Journal of the Transportation Research Board* 2675(9).
<https://doi.org/10.1177/03611981211004127>
- Ruijsbroek, A.; Droomers, M.; Groenewegen, P. P.; Hardyns, W.; Stronks, K. 2015. Social safety, self-rated general health and physical activity: Changes in area crime, area safety feelings and the role of social cohesion, *Health & Place* 31: 39-45.
<https://doi.org/10.1016/j.healthplace.2014.10.008>
- Sakarya Büyükşehir Belediyesi. 2000. *Sakarya Büyükşehir Belediyesi Arşivi*. Available from Internet: <https://www.sakarya.bel.tr> (in Turkish).
- Salaheldin, H. T.; Major, M. D.; Ahmad, A. M.; Tannous, H. O. 2023. Analyzing walkability in the vicinity of three metro stations in Doha, Qatar, *Open House International* 48(3): 487-503.
<https://doi.org/10.1108/OHI-08-2022-0207>
- Sangster, J. 1996. Toronto's Girl Problem: The Perils and Pleasures of the City, 1880-1930 (by C. Strange), *American Historical Review* 101(5): 1653-1654.
<https://doi.org/10.1086/ahr/101.5.1653>
- Schroeder, H. W.; Anderson, L. M. 1984. Perception of personal safety in urban recreation sites, *Journal of Leisure Research* 16(2): 178-194.
<https://doi.org/10.1080/00222216.1984.11969584>
- Seaman, P. J.; Jones, R.; Ellaway, A. 2010. It's not just about the park, it's about integration too: why people choose to use or not use urban greenspaces, *International Journal of Behavioral Nutrition and Physical Activity* 7: 78.
<https://doi.org/10.1186/1479-5868-7-78>
- Shahmoradi, S.; Abtahi, S. M.; Guimarães, P. 2023. Pedestrian street and its effect on economic sustainability of a historical middle eastern city: the case of Chaharbagh Abbasi in Isfahan, Iran, *Geography and Sustainability* 4(3): 188-199.
<https://doi.org/10.1016/j.geosus.2023.03.006>
- Sherman, D. R. 2005. *Participatory Parks Planning: Exploring Democratic Design as a Tool to Mediate Cultural Conflict over Neighborhood Green Space*. MSc Thesis. Massachusetts Institute of Technology, MA, US. Available from Internet: <http://hdl.handle.net/1721.1/33052>
- Slater, S. J.; Nicholson, L.; Abu Zayd, H.; Chriqui, J. F. 2016. Does pedestrian danger mediate the relationship between local walkability and active travel to work?, *Frontiers in Public Health* 4: 89.
<https://doi.org/10.3389/fpubh.2016.00089>
- Sreetheran, M.; Van den Bosch, C. C. K. 2014. A socio-ecological exploration of fear of crime in urban green spaces – a systematic review, *Urban Forestry & Urban Greening* 13(1): 1-18.
<https://doi.org/10.1016/j.ufug.2013.11.006>
- Stain, H. J.; Galletly, C. A.; Clark, S.; Wilson, J.; Killen, E. A.; Anthes, L.; Campbell, L. E.; Hanlon, M.-C.; Harvey, C. 2012. Understanding the social costs of psychosis: the experience of adults affected by psychosis identified within the second Australian national survey of psychosis, *Australian & New Zealand Journal of Psychiatry* 46(9): 879-889.
<https://doi.org/10.1177/0004867412449060>
- Taşcıoğlu, S. 2022. Kilis kentsel sit alanında geleneksel konut kullanıcılarının tercih ve önceliklerinin belirlenmesi, *Bitlis Eren Üniversitesi Fen Bilimleri Dergisi* 11(1): 377-389.
<https://doi.org/10.17798/bitlisfen.1033690> (in Turkish).
- Tuncer, C. O.; Akdemir, N. 2021. Güvenlik algısına etki eden faktörler üzerine bir inceleme, *Güvenlik Stratejileri Dergisi* 17(40): 825-863.
<https://doi.org/10.17752/guvenlikstrjt.1029863> (in Turkish).
- Türkseven Doğrusoy, İ.; Zengel, R. 2017. Analysis of perceived safety in urban parks: a field study in Büyükpark and Hasanağa park, *METU Journal of the Faculty of Architecture* 34(1): 63-84.
<https://doi.org/10.4305/metu.jfa.2017.1.7>
- Uittenbogaard, R.; Sebastian, C.; Viiverberg, J.; Boom, B.; De With, P. H. N. 2018. Conditional transfer with dense residual attention: synthesizing traffic signs from street-view imagery, in *2018 24th International Conference on Pattern Recognition (ICPR)*, 20-24 August 2018, Beijing, China, 553-559.
<https://doi.org/10.1109/icpr.2018.8545149>
- Ulrich, R. S. 1993. Biophilia, biophobia, and natural landscapes, in S. R. Kellert, E. O. Wilson (Eds.). *The Biophilia Hypothesis*, 73-137.
- Warr, P. 1990. The measurement of well-being and other aspects of mental health, *Journal of Occupational Psychology* 63(3): 193-210. <https://doi.org/10.1111/j.2044-8325.1990.tb00521.x>
- West, P. C.; Merriam, L. C. 1970. Outdoor recreation and family cohesiveness: a research approach, *Journal of Leisure Research* 2(4): 251-259.
<https://doi.org/10.1080/00222216.1970.11970005>
- Yazici, M.; Yaslikaya, R. 2021. Yerel yönetim ve kentsel güvenlik ilişkisi üzerine bir inceleme: Bandırma örneği, *Van Yüzüncü Yıl Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi* 6(12): 78-92. Available from Internet: <https://izlik.org/JA43ZP39PH> (in Turkish).
- Zhang, F.; Fan, Z.; Kang, Y.; Hu, Y.; Ratti, C. 2021. "Perception bias": deciphering a mismatch between urban crime and perception of safety, *Landscape and Urban Planning* 207: 104003.
<https://doi.org/10.1016/j.landurbplan.2020.104003>