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# The Importance of Ergonomics on Urban Squares: Case from Istanbul

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### Abstract

There is a close relationship between the creation of urban spaces and ergonomics. To make new stimulating and satisfying urban spaces, ergonomics criteria should consider. In this study, two main urban squares from Istanbul examined. Selected urban squares evaluated by site observation according to the classified ergonomics criteria. Strong and weak points of chosen squares discussed and some suggestions proposed. The results demonstrated the fact that urban equipment meets the individual ergonomic criteria are not sufficient in the use of both squares, and they need to be re-planned.

Keywords: Ergonomics; urban squares, Istanbul

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### 1.0 Introduction

Public spaces are the areas where people from all walks of life face, communicate, and interact. Streets, streets, access roads, crossing routes, parks, and squares are public spaces accessible to all. Rapoport (1977) defines public spaces as places where everyone can use freely, carry out daily activities, where people can freely express themselves, and communicate with other people. According to Habermas (1995), the essential feature of public space is that it is open to all citizens. Şahin (2005) shows public spaces as necessary and indispensable spaces in the city. All use public spaces, and people build new social relationships in these areas.

In addition to these features, it should be suitable and accessible to all kinds of vehicles. The squares, unlike the exclusionary character of private spaces, are inclusive for the whole city. They create everything that exists in the city and everyone and creates integrative environments. Therefore, it is not possible to determine the user characteristics of the squares in advance. Therefore, considering the different user groups in the design and regulation criteria of urban squares, every individual of the society should be considered. Designs that meet the needs of different users from all age groups can be realized by determining the ergonomic criteria correctly.

This study aims to examine how ergonomics will contribute to the design of urban squares. After evaluating the ergonomic qualification of the current situation over the two selected cases, it discussed how the ergonomically more successful arrangements could realize.

### 2.0 Structure

Ergonomics, in general, aims at transforming the designed environment into users who will enjoy the environment. It also seeks to improve the health and safety of users and improve the quality of life while dealing with the design and regulation of the built environment to ensure human productivity and comfort. However, while designing public spaces, ergonomic criteria should meet the physical characteristics, the social and cultural qualities and the aesthetics of the society. (Çekmecelioğlu etc., 2017).

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Public spaces and squares are places where special urban furniture is available depending on the social, cultural, physical, and psychological needs of individuals (Bayramoğlu ve Özdemir, 2012). The urban furniture in the public space enables urban life to be more enjoyable and meaningful and to create urban comfort and urban aesthetics (Yücel, 2006). The design of urban furniture should include the ergonomic features of the users as well as the solutions reflecting the environmental character in their designs and locations. In this way, users will be able to see the square as part of the place, to feel belonging, and to establish an environmental relationship.

### 3.0 Case Study

Kadıköy Square is one of the places that can address every user profile with its relationship with the Marmara Sea, its location on the Anatolian side, and its variety of transportation. (Figure 1).



Fig. 1. Kadıköy Square  
(Source: Google Maps)

Eminönü Square is one of the most important public open spaces of Istanbul in terms of its location on the European side and its historical importance (Figure 2).



Fig. 2. Eminönü Square  
(Source: Google Maps)

. Firstly, the ramps, staircases, seating units, flooring, lighting elements, waste units, green areas, bus stops, and info boards in Kadıköy Square and Eminönü Square were determined. After, they were examined ergonomically by using on-site observation technique.

### 3.1.Ramps

Ramps should be 10% for a height of 10 cm in open areas, 8% for a height of 10-25 cm, and 6% for a height of 25-50 cm (Erdenechimeg ve Erdenechimeg, 2012).

It determined that the ramps, which are one of the crucial elements for barrier-free public transportation in Kadıköy Square, are not enough. There are differences in the elevation of the floor due to planning errors. Although there are ramps in the square, wheelchair access is interrupted at all points considering the whole area (Figure 3).



Fig. 3. Ramps in Kadıköy Square  
(Source: Kutsal Göllü, Canbay Türkyılmaz, 2018)

On the southern part of Eminönü Square, there is a platform with a 110 cm elevation difference. The ramp with the most significant slope in the square is in this area, at the south-west corner of the square, about 32 meters long and 110 cm height (Figure 4). The slope on this ramp complies with the required criteria. However, there is no ramp solution at the exit from the lower passage, which is one of the main accessed spaces. It negatively affects the accessibility of the square.



Fig. 4. Ramps in Eminönü Square  
(Source: Çekmecelioğlu etc. 2017)

### 3.2. Stairs

Stairs are one of the circulation elements to organize the level difference in public spaces and to ensure user continuity. The wide age range of people using open space affects the step height and considering the number and number of steps by ergonomic standards provides ease of use. In the design of stairs and ramps, handrails should regard as for individuals who are weak and have difficulty in the grip. The number and dimensions of the steps should be suitable with the ergonomic standards (Erdenechimeg ve Erdenechimeg, 2012).

Since there are no differences in the elevation of the floor in Kadıköy Square, there are very few outlets that can define as stairs. Stairs in the entrance and exit of the metro meet the ergonomic conditions. There are no standards on the elevation of several steps in the area (Figure 5).



Fig. 5. Stairs in Kadıköy Square  
(Source: Kutsal Göllü, Canbay Türkyılmaz, 2018)

Stairs in Eminönü Square do not fit to the necessary dimensions (Figure 6). Also, it shows that the ramps on stairs located at the point where underpass came from the quay situated, but the ramp removed.



Fig. 6. Stairs in Eminönü Square  
(Source: Çekmecelioğlu etc. 2017)

### 3.3. Sitting Units

The sitting elements located in Kadıköy Square are positioned randomly on the pedestrian use axis. The design of the sitting elements used in two different types with and without a backrest is the standard 45 cm wide design for concrete sitting, which can see in other public spaces in Istanbul city (Figure 7).



Fig. 7. Sitting units in Kadıköy Square  
(Source: Kutsal Göllü, Canbay Türkyılmaz, 2018)

However, planning of sitting units with unique, contemporary, and aesthetic solutions, which are suitable for the square and the potential of Kadıköy, will increase the time spent by the users in the field. Sitting units in Kadıköy Square are independent of their settlements, and they are by ergonomic criteria since they meet the anthropometric criteria. However, considering the ergonomic design criteria of public space, their position in the square is inaccurate, and their number is insufficient according to user density.

The most important reason for the numerical failure of the sitting units is the lack of the upper cover felt in the square, the incorrect selection of the sitting elements, and the sunshine in the majority of the day. This situation causes users to sit on flat surfaces where are shaded walls, stairs, plant crates, and so on (Figure 8).



Fig. 8. Alternative sitting units in Kadıköy Square  
(Source: Kutsal Göllü, Canbay Türkyılmaz, 2018)

It can be said that the sitting units in Eminönü Square are located on the main flow axes of the pedestrians or at the intersection points, and this situation has positive effects for the users. The sitting units covered with natural stone (granite) and the corners designed with a soft bevel. Sitting groups are suitable as height (40 cm). It is wide (70 cm) and comfortable (Figure 9).



Fig. 9. Sitting units in Eminönü Square  
(Source: Çekmecelioğlu etc. 2017)

Granite material has a negative effect even in summer. It is also not comfortable enough due to the lack of backrest in the sitting elements. The low number of trees near the sitting elements and the absence of the upper cover element caused this urban furniture to be unavailable in extremely hot or rainy conditions.

### 3.4. Floor Covering

Floor elements are the essential elements of landscaping and form the basis of three-dimensional space. These elements, which used in planning by taking into consideration their features such as texture, color, line, form, etc., should complement the area in terms of aesthetics as well as their functionality (Şişman ve Yetim, 2004). In public spaces, the floor should be designed to contain non-slip surfaces during the walk, and the correct coating materials should be selected (Çekmecelioğlu etc., 2017).

No positive area found in the field of Kadıköy Square. There are elevation differences that are not suitable for stepping across the square. Due to the filling of the coast several times over the years, border stones are seen at different levels (Figure 10).



Fig. 10. Elevation differences in Kadıköy Square  
(Source: Kutsal Göllü, Canbay Türkyılmaz, 2018)

Old and broken floor covering materials filled with concrete between the floor renovation efforts have a very negative effect for the users (Figure 11). Different sizes, colors, and materials in the whole of the area do not relate to each other (Figure 12). At the same time, the filling of the shore increased the amount of hard ground, and the filled areas left as concrete.

The negativity of the floor covering affects the access of persons with physical disabilities in the square. Also, there are no visible guide surfaces for the visually impaired at any point other than only one point of the square (Figure 13).

There are maintenance hole covers, grids, flower beds, etc. which are placed randomly on the floor where the flooring is relatively regular. They have created unqualified ground surfaces due to visually incompatible materials selection, maintenance, and repair failure (Figure 14).



Fig.11. Concrete floor renovations in Kadıköy Square  
(Source: Kutsal Göllü, Canbay Türkyılmaz, 2018)



Fig.12.Different size, colors and materials of floor covering in Kadıköy Square  
(Source: Kutsal Göllü, Canbay Türkyılmaz, 2018)



Fig.13.Guide surfaces for visually impaired people in Kadıköy Square  
(Source: Kutsal Göllü, Canbay Türkyılmaz, 2018)



Fig. 14. Problematics on floor covering in Kadıköy Square  
(Source: Kutsal Göllü, Canbay Türkyılmaz, 2018)

After the recent reorganization works in Eminönü Square, it can say that the floor covering material is ergonomically suitable throughout the square. However, there are open points left for the lighting elements at many points of the floor covering, and there are elevation differences in the transition to different coating materials (Figure 15). Also, as a significant point, there is no raised floor material for the disabled. It also raises a negative situation for the ground in the square.



Fig. 15. Floor covering in Eminönü Square  
(Source: Çekmecelioğlu etc. 2017)

### 3.5. Lighting Units

The lighting elements in Kadıköy Square generally placed parallel to the road and coastline. Lighting elements used in different parts of the city have been used here as well. The lighting elements determined in the area are not different from each other in terms of size, shape, and material. In areas with high green density, the light was insufficient, and dark spots are seen. This situation negatively affects the visual comfort and creates insecure places in the night (Figure 16). Lighting elements should be considered not only as functional but also as a design object in public spaces.



Fig.16 .Lighting elements in Kadıköy Square  
(Source: Kutsal Göllü, Canbay Türkyılmaz, 2018)

In the Eminönü Square, the lighting elements, as well as the illumination of light, also have a guiding route. In Eminönü Square, the illumination units along the Ragıp Gümüşpala Street have concentrated along the roadside the sitting areas (Figure 17). In this case, dark areas are formed in the middle of the square and at the corner points. It is known that the square, especially around Yeni Cami, and its central parts remain dark in the night and create an insecure impression. It creates a situation that negatively affects visual comfort.



Fig. 17. Lighting elements in Eminönü Square  
(Source: Çekmecelioğlu etc.2017)

### 3.6.Waste Units

Waste units in public places are essential elements for keeping the areas clean and providing visual comfort. In Kadıköy Square, where there is heavy human traffic, garbage cans are independent of the number of people, and therefore, it is found to be insufficient. Their position within the area of the equipment evokes the appearance of a random. They positioned independently of pedestrians crossing route, sitting units, and intensive use areas. The negligence and openness of trash cans create unhealthy environments and cause visual pollution (Figure 18).

Waste units are of great importance in Eminönü Square, which is the scene of a busy stream of people. It saw that there are different types of waste units in the square, and this situation cannot create language integrity in terms of visual comfort. Also, the use of a garbage bag system in waste units facilitates the collection of these wastes easily, while on the other hand, it causes the scraps to scatter in case the bag torn.

The waste units in the square randomly placed, generally concentrated around the sitting units. When compared with the pedestrian movement, it can seem that they did not locate at some groups with intensive circulation in these areas (Figure 19)



Fig.18 .Waste units in Kadıköy Square  
(Source: Kutsal Göllü, Canbay Türkyılmaz, 2018)



Fig. 19. Waste units in Eminönü Square  
(Source: Çekmecelioğlu etc. 2017)

### 3.7.Green Areas

The green areas in public open spaces are the essential elements of thermal comfort in terms of providing visual comfort and creating shaded areas. During the observation in Kadıköy Square, it seems that the square used by the residents to relax and cool the hot days. These activities provided in green areas, in the shades formed by green spaces (Figure 20). Green areas in squares are essential areas for both visual comfort and thermal comfort.



Fig. 20. Green areas for relaxing hot days in Kadıköy Square  
(Source: Kutsal Göllü, Canbay Türkyılmaz, 2018)

Kadıköy Square has large green areas. In the field to the northeast of the road dividing the square, there are large shady trees and in the south-east area are seasonal flowers and trees on the way. However, as a result of inaccurate urban planning, the relation of green spaces with the sea has been weak. Many trees in the path parallel to the sea have dried up and cut due to lack of maintenance; It determined that new ones are not planted (Figure 21).



Fig. 21. Lack of maintenance in Kadıköy Square  
(Source: Kutsal Göllü, Canbay Türkyılmaz, 2018)

In the recent renovation work carried out in Eminönü Square, afforested areas increased (Figure 22). However, these areas remained as partial in some parts of the square. Since the trees in the square were tiny, the square was very hot in the warmer months, and the shadow areas were inadequate. There was not any flowering in the square, and therefore, the soil filled with garbage.





Fig. 22. Green areas in Eminönü Square  
(Source: Çekmecelioğlu etc. 2017)

### 3.8. Bus Stops

Bus stops are the stopping places designed for waiting comfortably apart from vehicle traffic. During the design phase of bus stops, ease of construction, compliance with aesthetic values, harmony with the environment, protection of people and protection against environmental conditions are vital points (Şişman ve Yetim, 2004).

The presence of the sitting units at the bus stops in Kadıköy Square facilitates the use of disabled and older people. Due to the opaque or semi-transparent top cover, the effects of the sun prevented and shadow areas created. All these data indicate that bus stops have the desired quality in terms of ergonomic criteria (Figure 23).



Fig.23. Bus stops in Kadıköy Square  
(Source: Kutsal Göllü, Canbay Türkyılmaz, 2018)

In Eminönü Square, the main bus stop located on Ragıp Gümüşpala Street, near the center of the square (Figure 24). The bus stop was in a central position and accessible. However, there is heavy traffic due to intersections around the stall. Also, the semi-permeable top cover of the bus station poorly designed, and it is not possible to wait under hot days.



Fig. 24. Bus stops in Eminönü Square (Çekmecelioğlu etc. 2017)

### 3.9. Info Signs

In public spaces such as Kadıköy Square where there is a lot of human density and having different orientations, direction, and sign plates become essential elements that provide information. Particular attention should be paid to the height, size, and position, not to

be made close to or lower than the human dimension and should not impede the passage of pedestrians. At the same time, the information and direction to be given should be clearly stated and should eliminate the confusion.



Fig.25. Info signs in Kadıköy Square (Kutsal Göllü, Canbay Türkyılmaz, 2018)

There is not enough info sign in Kadıköy Square. The users who are unfamiliar with the area have problems especially in transportation; it observed that those who descended from public transport could not find the direction to go to or the direction of public transport to reach. Only the info boards indicating the exit of the Metro and the direction of Haldun Taner Stage and found in the square, but it determined that it was negative in terms of both spatial and visual comfort due to the fact that it did not position human-sized, did not express clearly the direction to go, and could not noticeable (Figure 25).

Information signs and boards are becoming more critical, especially in areas with intensive tourist use such as Eminönü Square. However, although it is a touristic area and has intensive use, there is no information sign within Eminönü Square. It creates a significant disadvantage for the users. No single sign or board is indicating that this area is Eminönü Square (Figure 26).



Fig. 24. Info signs in Eminönü Square  
(source: Çekmecelioğlu etc.2017)

#### 4.0. Conclusions

Kadıköy Square is one of the most important public spaces with the geographical location and usage value on the Anatolian side of Istanbul, and different user groups intersect in the square. As a result of the case study, many problems found in the square. It determined that the square was not planned sufficiently in terms of urban ergonomic criteria, and it was complicated and inadequate. It is not possible to find accessibility, ergonomic principles, and aesthetic values that direct the public space organization in the square. The fact that public spaces are open to every user does not include individuals with disabilities in Kadıköy Square.

The visual interaction in urban areas did not take into consideration, and the public needs not fully met in Kadıköy Square. The urban furniture is designed individually as objects suitable for anthropometric measurements. But since they did not create a common language in their relations with each other, they could not create continuity. Kadıköy Square cannot stand out with its nature in the public space, and it remains as a transportation axis, transit route, and meeting point for the city.

As a result of the study, it seems that Kadıköy Square draws a usage profile far below its potential. For this reason, it is necessary to redesign the space with holistic design approaches rather than point arrangements and developments. It is required to create a competitive environment that will hold with the participation of many actors by opening a discussion program on national and international platforms. In this way, modern and useful public spaces that the city can breathe will design with the participation of everyone.

Eminönü Square is one of the most important public places of Istanbul in terms of both its geographical location and its historical significance, and it is one of the most critical dynamics of the city both historically, touristy and economically. Waiting for such a valuable public space to be perfect in every way can be seen as one of the collective wishes of the whole city. However, as a result of the studies carried out in this area, it can be seen that Eminönü Square, as it is today, is under-planned, complex, and undefined. The main problem of the Square is the lack of accessibility factor. In the field study, it seems that the square has not been able to show satisfactory performance in terms of many features, and it is also very controversial due to the interventions. Eminönü Square is in a state that is far below its capacity.

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