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FURNITURE AND ERGONOMICS IN THE RE-USE HISTORIC BUILDING

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Abstract

One of the procedures for the protection of historic buildings that are dysfunctional is to make the building a usable place for today's needs. The re-use in conservation methods is an approach that enables the building to continue to live while preserving its historical value and to respond to today's needs. Another situation that is as important as preserving the historical structure in the re-using of the historical buildings is that the building can provide the spatial comfort of its new user. Providing this comfort is possible by providing ergonomic requirements in the space.

With this study, the furniture used in the historical space after the re-using was examined in terms of providing the ergonomic conditions, and the questionnaires applied on ergonomics regarding, the user satisfaction with the user of the space were evaluated. The study aims to emphasize the importance of ergonomic decision standards by examining the spatial comfort, which can determine the duration of use of historical buildings, on a furniture scale. For the study; two traditional houses serving as cafes in Edirne province were selected. Taking a survey of 26 questions with the users coming to space and on-site observations were made by photographing space and measuring the furniture. In line with the data obtained, an evaluation was made about whether the furniture in the space is ergonomically suitable or not. A survey was conducted with 50 people in each space and the results were analyzed as a percentage. Survey and on-site observation results were compared. As a result of all the works; it has been observed that ergonomics is partially provided by 65% for cafe 1 and 50% for cafe 2 in the furniture scale in the work areas.

Keywords

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Ergonomics
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1. Introduction

One of the effective methods to preserve the historical buildings, which are our cultural heritage, is to reuse these buildings. At this stage, the choice of the new function and the interior designed with the new function are very important. In the reuse of historical buildings redesigned, the quality of the spatial comfort can determine the lifetime of the space. In this context, a questionnaire was made user's experience of the space and furniture in the space, depending on the new function in the space. With the data obtained from the surveys, it was aimed to investigate the level of spatial comfort, the level of harmony between space and furniture. For this purpose, the measurements of the furniture in the space and the distances between the furniture were measured and compared with the optimum values required to provide the expected needs. Thus, the ergonomics of the space were evaluated in terms of its anthropometric dimension.

The literature regarding this subject has been scanned. Akaydin and Turkyilmaz's (2018) "Ergonomics of Functional Transformed Buildings, Analyzing Uskudar Nevmekan as an Example" contains an example of the study conducted on this subject. In the study of Akaydin and Turkyilmaz, as in this study, observation and a questionnaire regarding the satisfaction with the users were made. And thus, space was examined in the context of ergonomic criteria. As a result of the work Akaydin and Turkyilmaz; indicated that the survey results and the observations coincided, and space met the ergonomic criteria.

In the literature, there are studies prepared to investigate spaces and furniture in terms of meeting ergonomic criteria, but there are not many studies in the context of historical space, furniture, and ergonomics. It was aimed to contribute to the literature with this study.

In the study, two traditional houses that were re-used as cafes in Edirne province were examined. A survey was made with 50 users in each selected building. Evaluations and observations were made in the buildings with the survey results. In short, in this study, the furniture and the relationship between the furniture and space were evaluated according to anthropometric decision standards in terms of their suitability for the necessary actions.

2. Materials and Methods

Questionnaire and on-site observation method were used in this study. The survey applied is a comprehensive survey of 26 questions. Questions were asked on the examination of the anthropometric, physiological, psychological, informatics, and safety dimensions of ergonomics in the space. However, since the anthropometric dimension of furniture and ergonomics was studied in this study, the 7-question part of the questionnaire was taken as the basis. The same questionnaire was applied to the same number of participants in both places. The number of participants is 50 in both places. The number of survey participants was determined based on the work of Akaydin and Turkyilmaz. In Akaydin and Turkyilmaz's studies, 40 people were surveyed. The time to apply for the survey is October 2020. Survey was applied to the users who came to the place at that moment in the work area. Information about the participants in the questionnaire was obtained about how often they use the space and whether they find the space positive in terms of use.

In the survey conducted with the users at space, the following questions were asked about this study. Survey responses and on-site observation were evaluated comparatively.

-How do you find the comfort of the furniture in the space? (comfortable, uncomfortable, neutral)

- What is your opinion about the spaciousness of the place? (spacious, neutral, stuffy)

-What do you think about the occupancy, vacancy rate in the space? (in terms of furniture) (balanced, cramped, neutral)

-Do you find the layout of the furniture compatible with the features of the place where they are located? (positive, neutral, negative)

-Do you think there is harmony between the size of the space and the dimensions of the furniture? (positive, neutral, negative)

-Do you think there is enough furniture according to the size of the space? (positive, neutral, negative)

-Do you think there is harmony between the historical attribute of the place and the furniture in the space? (Positive, neutral, negative)

As a result of the survey, when the ergonomics of both spaces are examined in terms of meeting the anthropometric decision standards, it is seen that some furniture does not provide the optimum boundaries, and some furniture is suitable. In this case, it can be said that spatial comfort cannot be fully provided based on the ergonomic adequacy of the furniture. The on-site observations mainly coincide with the survey results. With observation, it was concluded that spatial comfort could not be fully provided based on the ergonomic adequacy of the furniture.

2.1. Adaptive Reuse and Conservation

Cultural heritage is defined as works created by previous generations and have universal values. Historical buildings are people's cultural heritages that carry the social, cultural, and economic accumulations of past generations to the present. It is only possible to bring to the present day, the knowledge and experience that they had by protecting them. As time passes, people's needs, lifestyle, social, cultural, and economic structures change. This change in needs may require the function of the existing space to change. One of the methods for the protection of historical buildings within the scope of cultural heritage, which serves as a link between the past and the present is to make the building a usable space for today's needs. The reuse in conservation methods is an approach that allows the building to continue to live and respond to today's needs while preserving its historical value. Thanks to the re-use, the spiritual values of the historical building will be transferred to the present day. As an example, we can show the transformation of a historical train station complex into a university campus, the transformation of traditional houses into cafes, offices, museums, and restaurants.

According to Kasli, if the structure in question is a historical structure worth preserving, the meaning of the concept of "re-use" had a different dimension. The re-using of the historical building is the use of the building in a functional sense by allowing the contemporary use of the building with various adaptations, as well as the transfer of the spiritual values it has future generations by preserving the building. In this context, Altınoluk says that it is imperative to make use of our historical-cultural heritages sufficiently and to create a process that can inspire future generations from our experience. In this respect, the structures, the most effective way to make impressive and ultimately educative is to make them "living beings". There is no doubt that this purpose should be to given the structure a functional content, to make it useful for the society, to ensure that the society lives in it and the environment benefits from it (Altinoluk,1998).

In the reused building, the additions should be made in a way that does not cause permanent damage to the structure. The international rule is reversibility. The building should be able to provide the needs developed within the scope of the new function and while doing so, its original structure should not be harmed.

In the re-use of historical buildings, another important situation as preserving the historical building is that the building can provide the spatial comfort of its new user. The changes made in the space with new space equipment elements such as new flooring, new furniture, and lighting elements to be used in the space should be in the quality and appropriate to not throw the historical value of the space into the background. In addition, the new function should provide the spatial comfort of the user and the needs of the new function. Establishing the balance between preservation and renovation is possible by providing the needs of the user within the spatial characteristics, that is, by choosing the appropriate function for space and the space design suitable for the new function.

2.2. Relation of Furniture and Ergonomics in Historical Buildings

Ergonomics is a concept that comes into being with the combination of the word 'ergon', which means work in Greek, and the word 'nomos' which means natural law. Ergonomics means the science of work.

Ergonomics is a science-based discipline that examines designs that will complement people's strengths and abilities and minimize the impact of their limitations, along with the knowledge from science branches such as anatomy, physiology, psychology, engineering, and statistics. The wish of ergonomists and human behavior experts is to develop products, workspaces, or systems that are designed in harmony with people instead of designs that force people to work in an uncomfortable, stressful or dangerous way. What is needed to achieve this goal is to understand the differences in society such as age, height, strength, cognitive ability, cultural expectations, experiences, and goals, and to make designs considering these differences (Web-1).

The purpose of ergonomics is to characterize the designed space according to the user and to perform the function in the healthiest way while the user and the place are in harmony. Decision standards prepared with physiological measurements, performance measurements, psychometric and behavioral observations, and scientific guidelines and resulting from all these studies constitute the content and scope of ergonomics. These ergonomics standards are reached by scientific methods and research which ensures that features such as trust, comfort, functionality, and quality coexist in design.

The necessity of meticulous decision-making and implementation of each change made in the re-use historical places reveals the importance of the concept of ergonomics. The new function selected for the historical space and the interior space renewed in line with it can also determine the duration and quality of the new function and the use of this historical place. In order to ensure user comfort, it is necessary to create an interior by considering the standards of ergonomics. When this comfort is not provided, the user will be uncomfortable and maybe the use of the place will decrease and this will cause the values of the historical place to remain in the background.

If we consider the ergonomic criteria on the basis of space, we can explain it in five dimensions: anthropometric, physiological, psychological, informatics, and safety. Since the relationship between furniture and ergonomics will be examined in this study, the anthropometric dimension of ergonomics is focused on.

2.2.1. Anthropometric Dimension of Ergonomics

Anthropometry is the science that deals with the dimensions of the human body. It is used to create the measurements and dimensions of the accessories according to the body measurements of the human. While determining human body height, gender, age, and the professional field should be taken into consideration. For example, the distance between a man and a woman reaching out on a shelf varies due to their body structures. Other factors affect body size. These are culture, diet, climatic conditions of the region they live in, hereditary characteristics, and health problems (Kucukerman, 1978).

There are two anthropometric dimensions, static and dynamic. Static anthropometry is the measurements taken with the human body, not in motion. In other words, the measurements taken in standing and sitting positions are static anthropometric dimensions. Such as height of eye and elbow and knee, shoulder width. Dynamic anthropometry is the measure taken while the human body is performing a certain action. (Oborne, 1995)

For example; the act of sitting in a stance that people use from past to present to distribute the pressure created by gravity to different parts of the body, to provide their resting needs. In this action, the body weight is lifted from the foot, leg, and back muscles to a certain extent. The surface required to perform the sitting action can be a part of sitting elements with a certain height as well as being the ground plane. The designs that provide and analyze the sitting action are designed and shaped according to the data of the different environments they are in and the purpose of the sitting action in this environment. However, since human beings cannot physiologically change according to the environment, sitting action must provide anthropometric measurements and ergonomic conditions regardless of the environment. (Altiparmakogullari, 2009).

3. Result and Discussions

In this part, two examples of traditional houses adaptive reuse as cafe located in Edirne province are evaluated in terms of the anthropometric dimension of ergonomics in the context of interior furniture (Figure 1).

a b

Figure 1: (a) Café 1; (b) Cafe 2
(Edirne Cultural and Natural Heritage Preservation Regional Board Archive)

In terms of the anthropometric dimension of ergonomics; examinations and evaluations were made on subjects such as the comfort impression of the furniture in the space, the volumetric relationship between the space and the furniture, the suitability of the furniture in the space for the user's access and the impression created by the furniture and space volume on the user's perception.

3.1. Cafe 1 Analysis:

Figure 2: Cafe 1

In the answers received during the interviews with the users, for the question of "How do you find the comfort of the furniture in the space?", the answer of "Comfortable" is the majority. As determined in the building, the dimensions of the furniture used for eating and drinking differ from the optimum limit. It was determined that there were different sizes and designs of furniture in different rooms of the building (Figure 2).

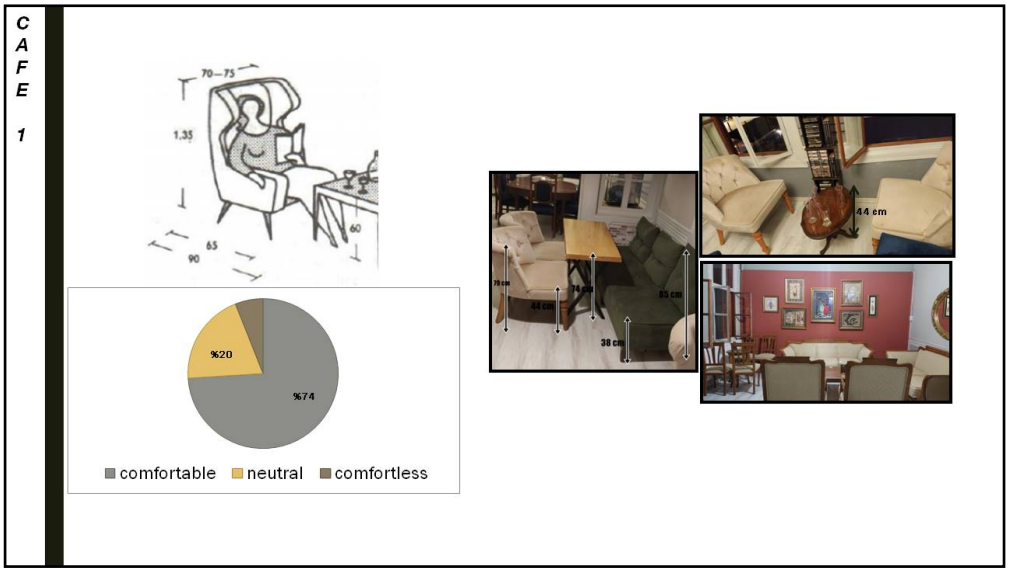

Figure 3: Cafe 1

As determined in the building, the dimensions of the furniture used for drinking coffee, sitting, and resting are different from the optimum limit. It was determined that there were different sizes and designs of furniture in different rooms of the building (Figure 3).

There is a sitting group in another room in the cafe, which consists of rooms. The height of the seating area of the triple sofa is 43 cm, and the height of the reclining part is 86 cm. The height of the double seat is equal to that of the triple seat. The height of the coffee table in the middle is 43 cm. Dimensions of single seats; all seat height; the height of the sitting area was measured as 102 cm and 45 cm.

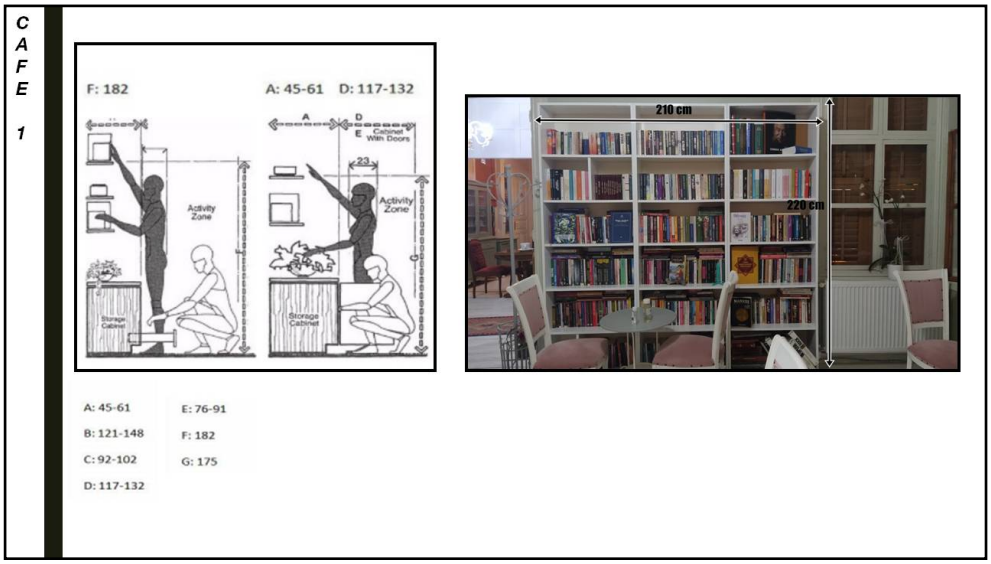

Figure 4: Cafe 1

Considering the average height of the users, every shelf can be accessed in the library units. It has been found ergonomically suitable. However, the table and chair in front of the library prevent access to the library (Figure 4).

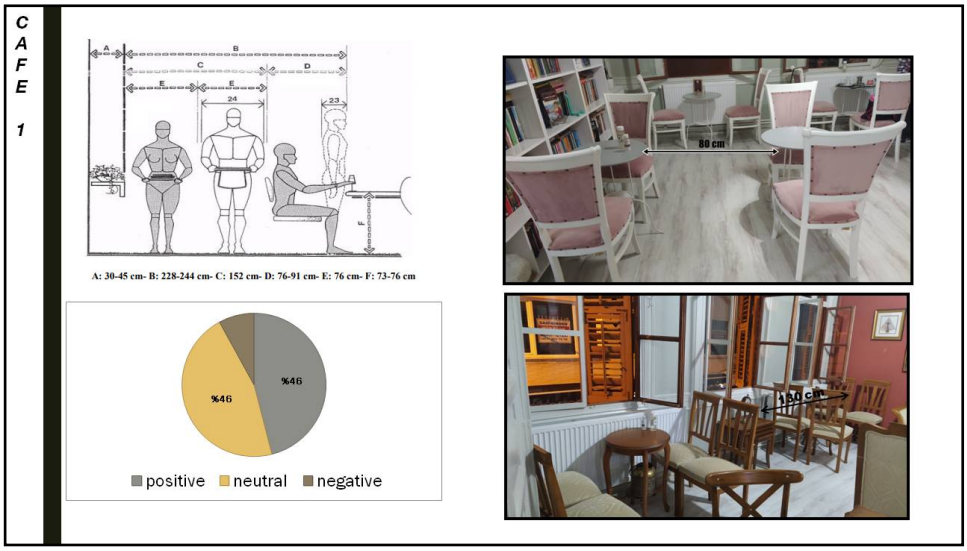

Figure 5: Cafe 1

When the limits of the action area are examined; it has been observed that there are openings between the tables where employees and customers can move freely. In the question about the occupancy-vacancy rate in the space, the furniture in the space was examined in terms of distribution. While 46% of the users found the distribution balanced, at the same rate founded neither balanced nor cramped (Figure 5).

Figure 6: Cafe 1

The building consists of rooms and each room has different types of seating units (Figure 6). Although this situation creates confusion in terms of design, when analyzed based on customer needs; it is a positive feature that seating areas that can be used for different purposes and for different durations have been created.

Figure 7: Cafe 1

When the spaciousness of the place is examined, it has been observed that the customers generally find the place spacious. For the question of "what is your opinion about the spaciousness of the place?", the users answered as 70% spacious and 30% neutral. Although that answer, with on-site observation when compared to the dimensions of the space, it has been observed that the furniture takes up a lot of space and makes the space narrow. Besides, furniture obstructs some transition areas (Figure 7).

3.2. Cafe 2 Analysis

Figure 8: Cafe 2

When we examine the second cafe, we again see that space consists of rooms. It was determined that there were different sizes and designs of furniture in different rooms of the building. Therefore, the comfort level also changes accordingly. When the survey was examined, it was found that 40% of the participants were comfortable for furniture and 8% uncomfortable (Figure 8).

Figure 9: Cafe 2

The building consists of rooms and each room has different types of seating units (Figure 8). Although this situation creates confusion in terms of design, when analyzed based on customer needs; it is a positive feature that seating areas that can be used with different purposes and for different durations (Figure 9).

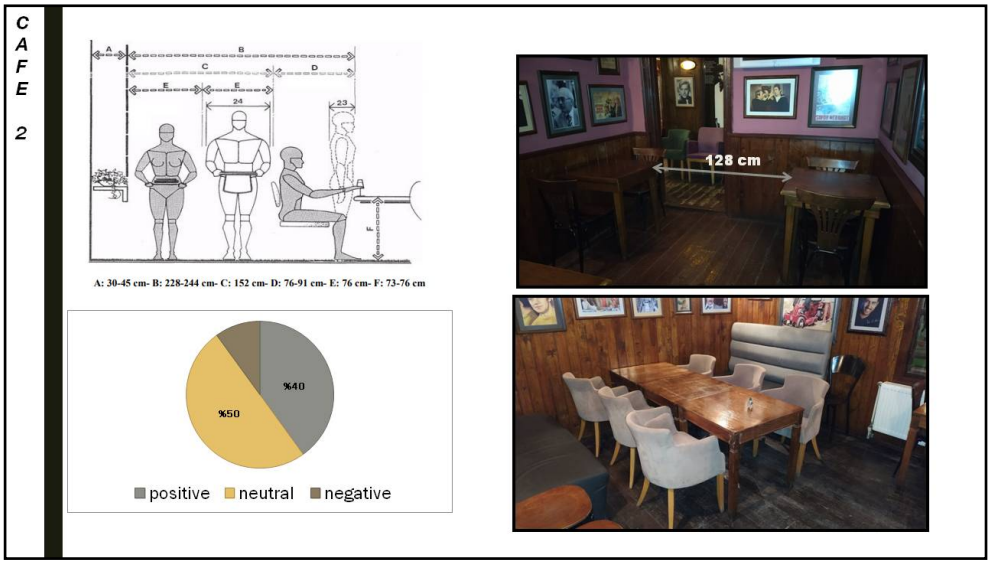

Figure 10: Cafe 2

When the limits of the action area are examined (Figure 10); it has been observed that there are openings between the tables where employees and customers can move freely. In the question about the occupancy-vacancy rate in the space, the furniture in the space was examined in terms of distribution. The users of the space found the space 40% balanced (Figure 10).

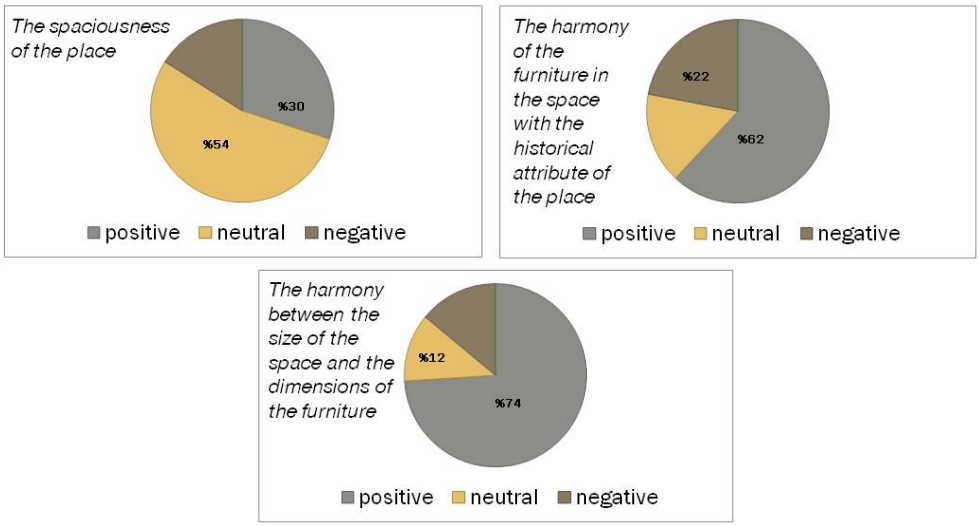

Figure 11: Cafe 2

When the spaciousness of the place is examined, it has been observed that 30% of users find the place is spacious (Figure 11). Whereas; when compared to the dimensions of the space, it has been observed that the furniture takes up a lot of space and makes the space narrow. In addition, it was thought that the furniture creates an irregular appearance as the columns were placed in front of the windows. Space size and furniture dimensions were found 74% compatible with the users (Figure 11). When asked about the harmony between the historical attribute of the space and the furniture, the users evaluated the design 62% positively (Figure 11).

As a similar example written on this subject in the literature, there is the study of Akaydin and Turkyilmaz (2018). Just like the anthropometric dimension of ergonomics part in that study, the furniture in the space was evaluated in this study, and survey and on-site observation has been made. Then the survey results were expressed in percentages. For Nevmekan, whom Akaydin and Turkyilmaz measured as a result of their study; they concluded that it meets the ergonomic criteria at optimum. Space was found 72-80% positive in anthropometric dimension analysis in Akaydin and Turkyilmaz's study. Since the buildings evaluated in this study are different, their comfort levels have also differed. Each structure should be evaluated in its own way.

4. Conclusion

In line with the observations made in the place, the survey study, and interviews with the users, it was tried to obtain data on the ergonomic suitability of the furniture in the selected places.

When the results of the survey conducted with 50 users with different purposes of using the space are evaluated with general percentages; it has been found as 74% comfortable, 6% uncomfortable for 1. Cafe, 40% comfortable, and 8% uncomfortable for 2. Cafe. When the occupancy-vacancy rate in Cafe 1 was examined, it was found as 46% balanced and 8% cramped. In Cafe 2, this ratio is 40% balanced and 10% cramped. Space was found to be 70% spacious and 30% neutral in Cafe 1 and 30% spacious and 16% overwhelming in Cafe 2. The harmony between the historical attribute of the place and the furniture was found as 70% positive and 16% negative in Cafe 1; 62% positive and 22% negative in cafe 2. The harmony between the size of the space and the furniture dimensions was found as 66% positive and 14% negative in cafe 1 ; 74% positive and 14% negative in cafe 2. Taking the average of all these data, cafe 1 is rated 65% positive and cafe 2 is rated 50% positive.

In line with the survey study and the interviews made with the users during this study, the following conclusions were made within the scope of the ergonomic evaluation of the furniture in these reuse buildings.

- Since the different furniture in the place has different comfort values, some users think it has been comfortable, while some find it neither comfortable nor uncomfortable. In general, few people think that it was uncomfortable. Some furniture does not fit with the optimum limits (Figure 2), (Figure 3), (Figure 8), as determined by the measurements.
- The presence of both comfortable and uncomfortable furniture in the place is beneficial for cafes in terms of human circulation in the place.
- Congestion was observed in some rooms in both places. The reason for this congestion is that the furniture in the space takes up more space than the size of the room. The reason for this is that the furniture in the space is more numerous than the size of the space, as observed.
- The presence of furniture in the transition areas in the first space creates confusion in the place and prevents the transition between two rooms.
- The diversity of furniture causes the unity of design language to be not achieved.

As a result of all these evaluations, when looking at the ergonomics of both spaces in terms of providing the anthropometric decision standards, it is seen that the optimum limits are sometimes not provided in places and sometimes they are provided in places. The reason for this is that the space consists of rooms and different sizes, and designs of furniture are used in each room. It is seen that the results of the survey predominantly similar to the observations made.

As a result of all the evaluations made, the importance of ergonomic decision standards was emphasized by examining the spatial comfort, which can determine the duration of the reuse of historical buildings, on the scale of furniture. It was also revealed that these ergonomic decision standards (Neufert, 1983) should be taken into consideration during the design process suitable for the new function.

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Conflict of Interest Statement

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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