Urban Outdoor Seating Elements, An Assessment for the Post-Pandemic Era

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Abstract
In threatening social life on a global scale, the Covid-19 pandemic epidemic made us think and experience the fragility of our cities from different aspects. The pandemic spread rapidly, feeding off the established social system of our cities. Having become crowded with population growth, urban communal areas were effective in increasing the flow of pathogens. The most intense common usage of the city is open spaces. In this article, it is aimed to determine the design-related effects of the pandemic in the urban open space. For the study, a seating element was chosen that provides contact density in the common use of urban residents in the urban open area. Following a literature review regarding urban public open spaces, the impact of the Covid-19 pandemic was investigated. In the urban open space, the effects of the pandemic are listed over the settlement, design and maintenance criteria of the seating element. The table prepared in accordance with information obtained in the article and the urban open-space seating element was discussed comparatively before and after the pandemic. In line with the findings, an attempt was made to determine the foresights that will benefit the design phenomenon for the post-pandemic era and urban open spaces in general.

Keywords
Urban Open Space; Post Pandemic (Covid-19); Urban Seating; Outdoor Furniture; Bench; Industrial Design.

Method
A literature research regarding urban public open spaces was conducted for this article. Information about the relationship between the pandemic and the city, as well as the current Covid-19 outbreak was obtained through the expression of the urban open space. With the foresight that the spread of the pandemic will be effective in urban open spaces, research was conducted regarding the act of sitting, where socializing human mobility stops; a study of technical literature was completed under the subtitles of site selection, design and maintenance of the seating element. Information obtained as a result of all these studies was compared under the heading of findings before and after the pandemic. The change in the seating element in the urban open space rendered by the pandemic was discussed. After the pandemic, an attempt to analyze the urban open space seating element criteria was made whereas the results were shared at the end of this article.

1. Introduction
In 2020, cities encountered a pandemic that posed detrimental effects for their social structures. As part of the fight against the pandemic, the WHO made public recommendations such as quarantining, social distancing and self-isolation. Such recommendations have become key strategies to reduce the spread of the global epidemic (Lunn, et al., 2020; WHO, 2020). However, said measures imposed against the pandemic go against the grain of human desire for social interaction. Thus, they also conflict with urban forms, i.e., cities, parks, squares, public spaces, which are designed on the basis of human social needs (Kelly, et al., 2012). Viewed as a hub of socialization, urban designs give rise to a contradiction between a tendency to increase social relations amongst individuals and measures imposed to reduce them with the impact of the pandemic (Xiao, Romanelli, Lindsey, 2019; Seema K. Shah, Kimmelman, et al., 2020), a situation that inevitably brings many questions to the forefront. We

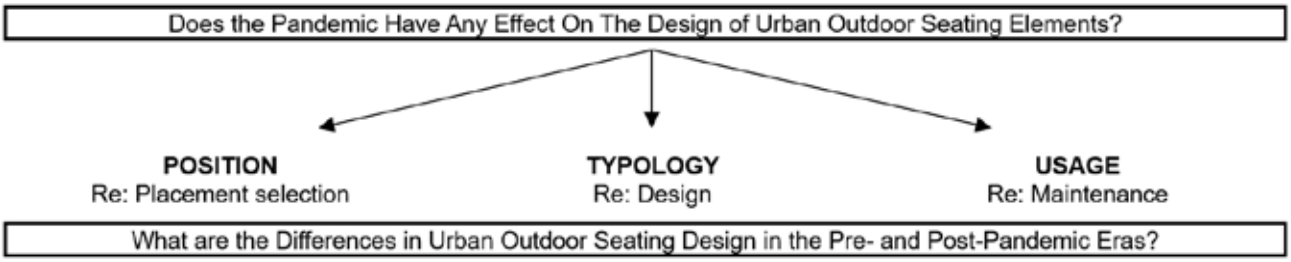


Table 1. Article method and problem layout.

are living in unprecedented times where measures are imposed to maintain distance in public open spaces designed for the purpose of having citizens gather and meet up. Due to these measures, city residents unable to get sufficient sunlight and fresh air in this current situation, had to go through an emotionally and physically challenging period of being apart from one another.

While urban life is becoming increasingly crowded, 70% of the world's population will live in cities by 2050, according to the medium variable projection (UN WPP, 2017). Although increased crowding in open spaces boosts opportunities for the virus to spread, cities with decent public health plans and programs constitute lower risks than rural areas with poor public health care plans and programs (Litman, T., 2020). Urban life crowding renders spaces between buildings more and more crucial. We know urban outdoor spaces as places where citizens can breathe. Said areas are designed as solutions for human requirements that not only reduce stress but also improve physical, psychological and mental health. Maintaining the known social use of public open spaces poses a challenge in controlling the spread of Covid-19 in the outdoor environment (Rojas-Rueda, et al., 2019). However, an updated and healthy design approach can secure the density of public open spaces needed for the physical and psychological health of urban residents (Velarde, Fry, and Tveit, 2007). Due to the human-to-human transmission of pathogens via droplets from a distance closer than two meters (WHO, 2020), The act of siting stationary in open space is highly likely to provide suitable conditions. This article aims to evaluate the design criteria of seating elements in urban open spaces affected by the pandemic. Known for their noteworthy work in the field of developing fundamental theories pertaining to the physical character, dimensions and components of public spaces, authorities such as Jan Gehl and William H. Whyte support keeping people's interest in public spaces alive. Nevertheless, the pandemic demonstrates that human interest in public spaces must be designed with new criteria in mind.

2. The necessity of urban outdoor seating and its relationship with the pandemic

With the exception of private property, all open spaces within the city limits are public, and those that are not completely covered with artificial enclosures and have unrestricted access from all adjacent areas can be defined as public open spaces (McKenzie, et al., 1978). The use of spaces, which can be described as the right to the city (Lefebvre, 1970) and shared by the citizens, creates social unity. We can summarize this association with the fact that what attracts people the most is other people (Whyte, 1980). In the use of these areas, the act of sitting is a position where people have stopped and are in a static state. The act of sitting can differ in various species, as it allows the muscles to rest. The allocation of places to live in the common areas of the city to meet the stay-wait behavior is one of the most important parameters for the vitality of a public space (Whyte, 1988). The choice of outdoor seating is affected both positively and negatively by the quality of the venue. In 1990, Gehl developed a four-point scale (View, microclimate, site placement, and neighborhood/edge relationship) to assess the quality of settlement In connection with the city quality study. In terms of the results of this, it was determined there was a clear link between seating quality and increased use. It can be said that the position in the urban space shows the position of the people in the social venue

and vice versa (Altman & Rapoport, 1980). There are a number of physical conditions that affect outdoor activities in cities. Outdoor activities in public spaces can be divided into three categories, each placing very different demands on the physical environment: Essential, Optional and Social activities (Gehl, et al., 2011). In three outdoor activities, people walk (Functional), sit (Recreational), talk (Social) Among these, which overlap with standing/sitting behavior, Optional activities take place only when the external conditions are suitable (time, place and motivation). The venue and situation no longer forces people to guide their actions, i.e., standing, sitting, eating, etc. When the quality of urban open space is appropriate, those in the act of sitting will also engage in spontaneous social activities. Social contact can be active as well as passive (just seeing and hearing other people) (Gehl, et al., 2011). In the urban open space, there is a gap between other people and objects while doing all these activities. The anthropologist Edward T. Hall first defined this gap as distance (see Table 2). The common source of information about the distance separating two people is the loudness of the sound (Hall, 1966). The use of distance in human spatial relations such as the act of sitting can be called a study of perception and usage (Gladstone, I., 1961; Ottenheimer, H., 2011). The three types of space and the four measures of distance in interaction are still used by social scientists and architects today. They provide useful guidelines for defining interaction areas and comfort zones for a range of behavior in the outdoor environment.

The three types of spaces are:
• Fixed feature space: includes things that are stationary (walls, fixed seating elements).
• Semi-fixed feature space: contains movable objects that are not fixed (movable furniture).
• Informal space: Includes personal space around the body that travels with a person and determines the distance between people.

As is seen in Table 1, proxemics, which define the space around a person in stages, are among the important subjects we shall use as criteria in our study for the act of sitting in the urban open space. In lieu of a specific vaccine against the coronavirus, physical distancing and quarantining the population are amongst the most urgent and precautionary measures (Hishan, Ramakrishnan, et al., 2020; Salama, A. M. 2020). Urban open spaces, with the space they create in the city, are useful for meeting social meeting needs as well as allowing people to breathe and come together with nature. The World Health Organization (WHO) has recommended outdoor spaces should be chosen instead of indoor spaces in situations that require people to come together. Effective in the spread of the pathogen, it has led to the placing of signs warning three meters between stationery seats in order to increase the physical distance of people. It also warned people to maintain a distance of at least two meters from others, and to use masks if they cannot guarantee this distance (WHO, 2020; UK Gov. COVID-19 Secure Safer Public Places, 2020). Physical distancing is a key public health strategy to reduce transmission and potential re-emergence of the Covid-19 pandemic. In particular, increasing the amount urban outdoor spaces and enabling people to enjoy outdoor spaces for longer periods of time increases the importance of the act of sitting and can assist efforts to reduce the spread of the virus in line with public health guidelines (NACTO + GDCI, 2020). It is against human nature to keep more than six people from different households from getting together during the pandemic in an outdoor sit-in, gathering and gathering center. Regarding precautionary measures to be implemented in the use of parks/gardens, recreation and recreation areas, Article 56 of the Covid-19 epidemic management and study guide published by the Turkish Ministry of Health, recommends compliance with social distance rules of at least a meter and marking it with signs, and visitor planning should be carried out at a basis of one person every four square meters. The same article also recommends there should be a distance of at least three meters between table seating areas, such as picnic areas condusive for eating and drinking activities (T.C. Ministry of Health, 2020 S:289).

Measurement Unil	Distance Definition	Explanation	Seat Sharing
00-45 cm	Private	Expresses intense feelings.	In physical contact.
45-76 cm	Personal Near	Amongst close friends and family.	Communicating in a private atter tone of voice.
76-120 cm	Personal Far	Amongst close friends and family.	Can dine together.
120-210cm	Social Near	Friends, neighbors, colleagues.	Voice communication in a speaking tone.
210-360cm	Social Far	Neighbors, colleagues, acquaintances.	High voice communication in a speaking tone.
360-760cm	Public Near	Used in formal situations.	One-way communication.
760- cm	Public Far	To Observe.	Spectator status.

Table 2. Four basic and eight distances (Proxemic Fields) were determined according to social circumstances (Hall, 1966). Table content was developed by the authors.

The WHO, ECDC, CDC and TTB have stpiulated that crowded indoor spaces should be avoided, and that open spaces are much less risky. In regards to evidence surrounding Covid-19 pandemic transmission which was obtained from numerous studies, there is international consensus that proximity, prolonged contact, high frequency of contact, and the use of limited shared environments are all strongly associated with a high risk of transmission. The average risk of transmission is associated with the proximity of social interactions (WHO, 2020). There is scant evidence of transmission of Covid-19 and other respiratory viruses in outdoor environments. Nevertheless, extended meeting times or the inability to maintain proper distances poses a risk which can facilitate transmission during the stationary act of sitting in such environments (see Table 3). Therefore, it is important to recognize that close outdoors interactions can pose a risk (Nooshin Razani, M. D., et al., 2020; Kelly, M. P. 2021).

Factors associated with contamination risk	Lowest risk of contamination	Highest risk of contamination
Environmental factors		
Distance The degree of proximity is highly dependent on current regulations. rThe degree of contact between groups can be reduced by measures such as placement distance of the seating element and stimuli.	Always maintain a distance of two meters. People with weaker social bonds pose a low risk as they are unlikely to be close for any significant period of time.	Regular close interaction of one meter. Since social venues are open to the use of all citizens, the level of proximity poses a high risk in the use of those who had social ties before.
Duration Although it is variable, it can be said there is a medium level of risk.	Contact lasting a few minutes or less.	Contact lasting a few hours.
Number of people The standard number of three people has been temporarily reduced to two people In all independent bench designs.	Wide distribution of people interspersed.	Crowding of people with close contact.
Common weather and environmental conditions	Outdoor venues naturally have lower risks.	Indoor venues with insufficient ventilation, low temperature and humidity.
Viral emission	Passive activity Face cover/mask.	Dynamic activity No face covering/no mask
Shared surfaces	Infrequent contact with rarely shared surfaces. Easy cleaning. The risk can be reduced through self-cleaning and regular cleaning.	Regular contact with common surfaces. Infrequent cleaning. There is a potential for increased risk through the joint use of seats, backrests and armrests.
Human factors		
Communication frequency	Case isolation, infrequent contact.	Daily, regular contact. Public open spaces are exposed to the intensity of use by all citizens. This situation increases the level of risk.
Social Bond	Persons held in a limited isolated area.	Public open space shared with multiple strangers.
Hygiene Behavior	Regular hand hygiene, face covering/ mask use	Rare hand hygiene, no face covering/maskless use. Being outdoors can be misleading and reduce precautions.
Socio-economic factors These depend heavily on the location of the seating element and the demographics of the region they are in.	People working from home who have ample space to be isolated.	Poverty, crowded housing and people who cannot be isolated for both space and financial reasons.

Table 3. Summary of factors associated with the risk of transmission (using EMG/Nervtag document, 2020; Weed, M. & Foad, A. 2020). Use of public space will increase as stay-at-home restrictions ease.

In order to ensure social distance in city centers, it is recommended to re-plan spaces which are necessary for people to conduct their walking, stopping and sitting activities. (NACTO-GDCI, 2020). Interventions should be focused on areas with high pedestrian traffic, especially since immobile places in space sharing pose a great risk (UK Gov. COVID-19 Secure Safer Public Places, 2020). It is foreseen that fixed social contact in urban open spaces may boost the spread of the pandemic. As people begin to mingle again, urban designs that enable individuals to better manage their personal risks should be promoted in order to reduce the further spread and resurgence of Covid-19. Sitting behavior can be rearranged according to physical distance changes In urban open spaces. Outdoor use is crucial during and after the pandemic whereas public spaces are possible where communities can act in a healthy, safe and equitable manner, sit down to rest and pause. These strategies can be adopted and implemented by leading cities embracing the urgent need for lasting change in this unprecedented time (NACTO-GDCI, 2020). In this regard, it may be acknowledged that urban open spaces are indispensable in the treatment of urban dwellers during the pandemic process. While open spaces are viewed as less effective compared to enclosed spaces in the spread of pathogens, our urban designs that become crowded and constrict the distance in their spaces pose a threat. Nonetheless, in the fight against the virus, we need open spaces and to breath fresh air more than ever before.

3. Urban outdoor seating elements

All places and objects open to common use have been transformed with the impact of the Covid-19 pandemic. Seating elements as immobile contact points in open spaces are among the products where the effect of the pandemic has changed noticeably.

There are usage expectations that will cause a discontinuation in outdoor urban activities and seating element preferences (see Table 4). The interaction of people during this discontinuation can create sufficient grounds for the spread of the pandemic.A survey of seating preferences in urban open spaces P:111) was used. This table was developed by the authors.

URBAN OUTDOOR ACTIVITIES	USAGE OF SEATING ELEMENTS
Walking	Resting
Running	-
Playground	Waiting Observing
Walking Dogs	Waiting Observing
Yoga-Meditation	-
Reading	Waiting
Eating	Waiting

Table 4. The relationship between urban outdoor activities and the usage of seating elements. The table was prepared by the authors.

MOST EFFECTIVE	CATEGORY QUESTION	FACTOR	PRIVATE/SPECIFIC
	Seating Placement	Microclimate and Contextual Conditions	Sun/Shade Exposure
			Enclosed/Outdoors
			Public/Private Grounds
		Availability	The First Avilable Empty Seat
	Seating Direction	Visualization	Other People
			Water
			By Someone Else on the Topic
	Seating Shape and/or Style	Shape	Benches
			Walls
LEAST EFFECTIVE			Various Seating Elements for Relaxing
		Style	Wooden Benches
			Benches with Backs

Table 5. Factors affecting seating (Devlin, J. A., 1996.

It can be said that seating preference patterns exist in certain user classes in the public open space, and that these models are based on certain micro-climatic and contextual conditions rather than seating type and/or style (see Table 5). We can examine the seating element under three headings: The position where the preference of seating element usage occurs (location selection), usage typology (Design) and the Usage Sustainability (Maintenance). Thus, the differences in the seating element before and after the pandemic will be determined in more detail.

3.1. Seating Element Location Criteria:

The importance of positioning urban open spaces in a context where different social groups such as gender, age, social status, culture, ethnicity and occupation have non-discriminatory access is known (Lefebvre, 1970; Lynch, O. M., 1979). Therefore, we cannot talk about only one function in public spaces (Lennard, S. H. C., Lennard, H. L., 1987, p: 13). For this reason, access types can be mentioned first in order to provide sitting in open spaces. It is essential that places are accessible to a variety of users, based on different classifications of users. For a venue to have unlimited access, it must show certain features in terms of physical, visual and social access (Francis, M., 1989). The action of sitting makes several important demands regarding the particular situation, climate, and place. In general, sitting activities take place only where the external conditions are suitable, and sitting places are chosen much more carefully than standing ones (Gehl, J. 2011. P:155). Visual access is an equally important element in making people feel free to enter the space (Carr, S., et al., 1992, p: 144; Gehl, 1987, p: 113). In terms of the relationship between social behavior and the urban environment, it is important to know the 'surprise effect' as the most important factor to avoid when planning out a public space (Greenbie, B. B., 1981). It can be said that the opportunity to see the events in the seating area is a dominant factor in the choice of seating, but other factors such as sun and wind direction also have an impact. Many researchers cite a relationship between environmental conditions such as sun, shade or wind and the use of space. Protection from these elements is considered according to the climate of a particular place to sit (Carr, S., et al., 1992; Gehl, 2010; Francis, M., 1989). In addition to physical needs, psychological needs can also influence where a person chooses to sit. People have a need to control their environment. A valid example for urban open spaces would be a person's ability

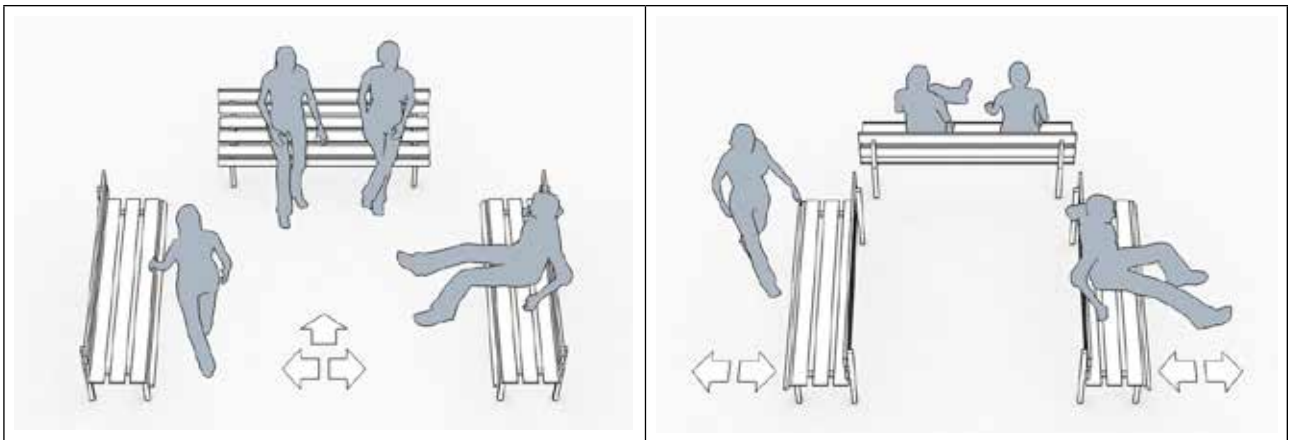
to change the environment using movable chairs. Movable seating elements help people coordinate the space themselves (sitting in the sun, being alone or sitting in a group) and adapting them according to their needs (Francis, M., 1989 p: 167). People's seating choices are preferred along the façade and spatial boundaries.

When people want to stand, they tend to seek support from the details of the physical environment by standing, leaning or sitting. Rather than the center, people choose the borders of an area, and it is known that they want to leave the openness in front of them where they can perceive the space. The placement of the seating element should be directed by conducting a thorough analysis of the spatial and functional qualities of the location. Each bench or seating group should preferably have a distinct local quality and be positioned in a small space, a niche, a corner, in a place that offers intimacy and security (Gehl, J. 2011, p:159). The reason for preference in the choice of seating is also related to the type of seating. Demands vary for different groups of people. Children and teenagers often make little demands on the type of seat and in most cases agree to sit almost anywhere; on the ground, on the street, on stairs, by a fountain or on flower pot edges. On the other hand, other groups of people place higher demands on the seat type. For many people, a defined seat, bench or chair is a basic requirement to be able to sit. the comfort and practicality of the seat is important, especially for the elderly. For these reasons, a well-equipped public space should offer many different seating opportunities to allow all groups of users to stay. The general demand is to provide and place an adequate amount of primary seating in carefully selected, strategically correct locations that offer as many benefits to users as possible (Gehl, J. 2011, p:159). Sitting pairs should be placed at an angle of 90°-120°, this is suitable for both conversation and sitting alone. Those using walkers need space to position their walker next to the bench while sitting. Studies show that about 30% of the physically challenged cannot manage more than 50 m. without pausing, and 20% can only manage between 50 - 200 m. Seating elements provided at 50 m. intervals will help less mobile people use open spaces more easily and encourage the use of public spaces (Gehl, J. 1987).

We can mention two main systems that have proven to have a significant impact on people's interactions regarding how social environments affect mental relaxation or recovery.

The sociopetal space: this tends to bring people together and encourage communications and interaction. In spatial terms, it is defined radially, with ways of joining and overlapping, and interconnected rings and spirals.

The sociofugal space: This tends to distance people from each other and suppress communications. It is spatially described as box-like or grid-like.



Sociopetal seating layout (Inward).	Sociofugal seating layout (Outward).

Figure 1. Social space usage layouts (illustrated by the authors).

In this way, designers can regulate the amount of interaction with the layout of items such as furniture in the integrated space (Main, B. & Hannah, G. G., 2010).

While sociopetal location layouts encourage face-to-face interaction by directing people to each other, sociofugal location can naturally provide the desired isolation in pandemics (see Figure 1). Public open spaces, which we believe meet community demands and needs, are key to the vitality of a city, whereby a public space must constantly attract and retain visitors in order for it to be considered successful. While the level of activity is partly a result of the number of visitors at a venue, Gehl, Whyte et al. underscore the importance of activity duration, stating that spaces with sustained activity levels are often achieved by encouraging longer individual stays. It can be said that the settlement of seating areas in open urban areas can be used effectively to increase social communications or reduce social distance.

3.2. Seating Element Design Criteria:

In the use of open space in cities, the population character is extremely diverse. The needs, preferences and lifestyles of this mixed community differ as much to its anthropometric measures. Psychological needs include the need for things such as security, easy access, privacy, social interaction, comfort, and identity (Krupat, A., 1985). Some or all of these physical and psychological needs can be met through the design of the seating elements in an open space which beckons people to use it and puts them at ease psychologically. Beyond the location of the seating, the layout and form of open spaces also affect their use. It is seen that seating elements, such as wall corners or seating groups, which provide more variation in seating position and orientation, are used more than straight or linear seating (Joardar, S. D., & Neill, J. W., 1978). In addition to seat types, location, and orientation, not everyone needs or is compatible with the same type of seat (Lennard, S. H. C., Lennard, H. L., 1987, p:31). The needs of people are discussed from the aspect of two basic (functional and aesthetic) design approaches. In not taking into account the "cognitive, emotional or social aspects" of people, "Functionalist" designs (see Figure 2) are concerned with the optimal way in which tasks can be accomplished. (Krupat, 1985, p: 164). Physical and psychological comfort are essential needs that should be addressed together in public space design (Carr, S., et al., 1992, p: 92).

Sitting should not only provide physical comfort, but should also provide psychological and social comfort that results from giving users choice and control over where they can rest (Whyte, 1980, p: 28). p:75). People or small groups of people are interested in designs offering more opportunities to communicate with each other (Gehl, 2010, p:75). As well as the design criteria compatible with human anthropology and ergonomics in terms of quantity, the effects of psychological quality characteristics are also important in the seating element.

Human spatial design standards are derived from ergonomic and cultural data. Major differences can be seen between cultures and land use. Standards are often created to ensure:

1. Minimum safety distance (ergonomic / legal)
2. Perceived user comfort (psychological / perceptual)
3. Traditional behavior (cultural/ritual)
4. Aesthetic choice (cultural / personal)

Most "normative" standards require cultural adjustment before they can be applied to a particular design environment. Cultural standards are often referred to as the 'hidden dimension' and can sometimes be absolutely contradictory (Harris, C. W., & Dines, N. T., 1998 p:55). The design criteria that deems people's personal behavior as effective as their social behavior during the spread of the pandemic
The seating element is designed in various forms that can provide pause/rest in the sitting position. The variety of forms increases with additions to meet the various needs of the seating element. The seating element can be comprised of components such as a whole structure, sitting area, supports, back support and armrests, or it can be in a wide variety of forms with additional functions such as flower pots, lighting or bicycle carriers. When we examine the seating element sections over their measurements (see Figure 3):

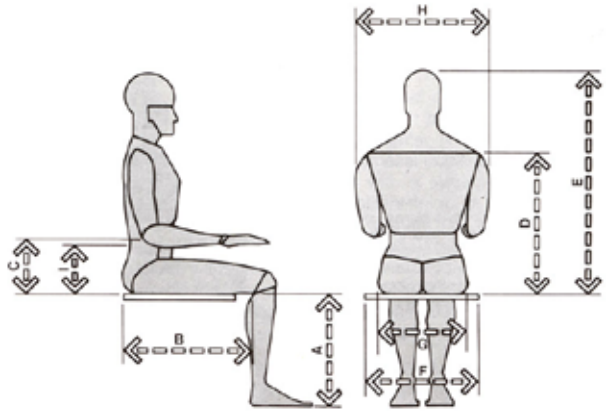


Figure 4–4. Key anthropometric dimensions required for chair design.

MEASUREMENT	MEN Percentile 5 in	MEN Percentile 5 cm	MEN Percentile 95 in	MEN Percentile 95 cm	WOMEN Percentile 5 in	WOMEN Percentile 5 cm	WOMEN Percentile 95 in	WOMEN Percentile 95 cm
A Popliteal Height	15.5	39.4	19.3	49.0	14.0	35.6	17.5	44.5
B Buttock-Popliteal Length	17.3	43.9	21.6	54.9	17.0	43.2	21.0	53.3
C Elbow Rest Height	7.4	18.8	11.6	29.5	7.1	18.0	11.0	27.9
D Shoulder Height	21.0	53.3	25.0	63.5	18.0	45.7	25.0	63.5
E Sitting Height Normal	31.6	80.3	36.6	93.0	29.6	75.2	34.7	88.1
F Elbow-to-Elbow Breadth	13.7	34.8	19.9	50.5	12.3	31.2	19.3	49.0
G Hip Breadth	12.2	31.0	15.9	40.4	12.3	31.2	17.1	43.4
H Shoulder Breadth	17.0	43.2	19.0	48.3	13.0	33.0	19.0	48.3
I Lumbar Height	See Note.							

Figure 2. Measurements for a seated figure as defined by Dreyfuss.
https://www.core77.com/posts/90066/Rethinking-Chair-Comfort

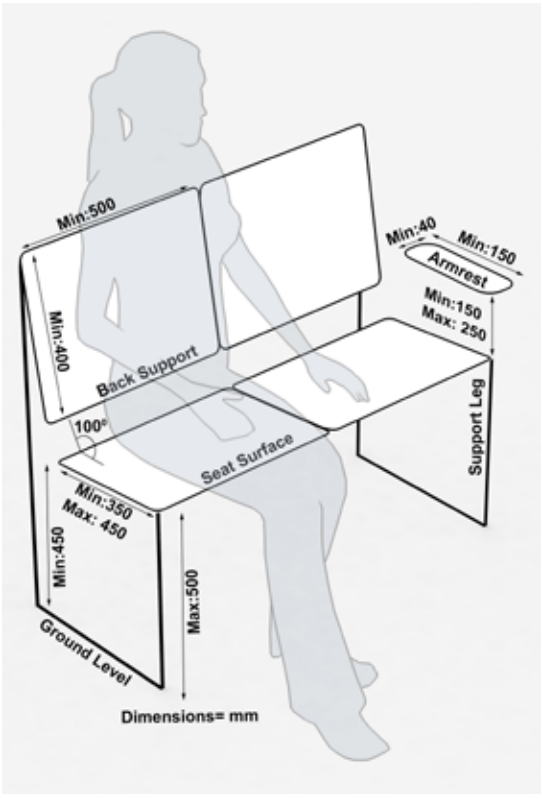


Figure 3. Typical freestanding seating sections and certain common measurements (Harris, CW, & Dines, NT, 1998, p:240; Marcus, CC, & Francis, C. 1997 ; Url: https://www.marshalls. co.uk/commercial/blog/street-furniture-design-and-the-equalities-act). Developed and prepared by the authors.

The seating surface should be inclined to the rear between 2° - 10° on the horizontal axis as well as an angle of 95°-105° between the seat and the back support. The seat surface depth of the seat should be between 35 cm – 45 cm for benches with backs and 75 cm for benches with open backs. A seat height of 50 cm is usually the most comfortable. The front edge of the seat should be curved, not angular. When timber boards that are closely spaced and follow the contour form are used, it is generally preferred to have a surface size of 20 cm. While the seat length should be 50 to 60 cm per person, people will sit closer together if there is an armrest between them. If a support is used to cover the front surface, a 8 cm kick clearance is required beneath the seat. Backrests with a slant and a slight curve arcing towards the rear are comfortable. The height of the backrest should be 50 cm in order to provide support for people's backs and shoulders. Backless benches allow people to sit on both sides at the same time. Armrests are useful both for helping people get up from the seat and for dividing a bench so that more people may sit. The edge of the armrest should extend all the way to the edge of the seat and have a firm, rounded grip surface. There are shape changes in line with different features in the typical seating element equipment for the usage area types. Due to the diversity of user needs and criteria in the design of open public space seating elements, simple solutions targeting the general median level are used intensively in the dimensions and typology of the integrated design and its elements.

Design - Plan	Product design corresponds to the planning stage of management.	Redesign of the seating element suitable to the pandemic conditions.
Production - Do	Production refers to making or working on the designed product.	Production with materials and methods suitable for pandemic conditions.
Establish - Check	Review the assembly, analyze the results, and identify what you have learned.	Monitoring and control of usage during the pandemic process.
Research - Action	Mass production implementation of the approved solution.	Spreading the effective solution against the pandemic to all relevant products.

Table 6. Evaluation of the outdoor seating element usage process, making use of Deming, W. Edwards, 1982. The table was developed by the authors.

3.2. Seating Element Usage Period Maintenance Criteria:

It is as important to provide and plan out places to live in urban open spaces as it is to maintain their function throughout their use (Whyte, 1980; Gehl, 1987). Urban open spaces are places in nature and outdoor conditions. For this reason, there is no protection between the equipment such as the seating element positioned here and the environment. Thus, seating elements positioned in urban open spaces are designed with the principle they will be directly exposed to open environmental conditions and protect themselves.

Moreover, outdoor seating elements are affected by physical wear, vandalism and abuse. The urban seating element requires monitoring, cleaning, repair and retouching throughout the period of use where it is positioned. It is crucial to eliminate the destruction of seating elements due to various reasons for their sustainable use. Some of the most successful projects encountered involve processes that are routinely reviewed and rearranged to meet changing conditions. Urban furniture can be easily added, removed, reconfigured, sometimes reinforced and transformed into positive benefits for the space. For in-use maintenance, the Plan - Do - Check - Action (PDCA) model may be used to emcourage continuous improvement and implement change (Deming, W. Edwards, 1982), (see Table 6).

With the post-use evaluation (PDCA) method, seating elements in outdoor areas may be tested to see how well they meet function and user needs. Such an assessment is recommended to identify opportunities for improvement and initiate change.

Another important factor is that the seating elements are clean and ready for use. Outdoor seating routinely accumulates dust, pollution, leaves, bird droppings, and spills from food or beverages, with the horizontal parts of the seat accumulating more than the vertical parts. Most public seating is never or rarely cleaned except for the natural forces of rain and wind. Of course, users may also be cleaning seats without realizing it. In most cases, the need for cleaning is minimal. The combined effect of wind, rain, and occasional sweeping away of garbage by users is usually sufficient. If more is needed, it is cleaned by the janitor assigned by the management responsible for the open area. Seats under canopies that block precipitation or solar rays are more likely to be cleaned manually (Main & Hannah, 2010). With the effect of Covid 19, areas with high usage should be cleaned more frequently, whereas particular attention should be given to the cleaning of frequently touched surfaces (seating area armrests). For this purpose, 1/100 diluted (half a small tea glass per 5 liters of water) bleach (Sodium hypochlorite Cas No: 7681-52-9) can be used as a disinfectant after cleaning with water and detergent. Surface disinfectants containing active substances approved for viruses and having a “Biocidal Product License” issued by the Ministry of Health can be used for surface cleaning and disinfection (T.R. Ministry of Health, 2020 p:289). Since the design of open space seating elements is compatible with social gathering, an attempt to transform them into forms suitable for the pandemic with temporary defined zones and barriers was made. As the Covid-19 virus can remain in the air and on

surfaces for a long time, cleaning activities in public spaces, especially high-contact surfaces such as doors, handles and furniture, have been increased. The amount of furniture provided to users has been limited in order to reduce the disinfection workload and risk of contamination (Peinhardt, K., & Storring, N. 2020). Once discharged from the body, the coronavirus can remain active on surfaces for hours or days.

If a person touches the infected surface, the virus can enter the body and cause infection by transferring it through the hands to the eyes, nose or mouth (WHO., CDC., 2020). Evidence suggests that contact with infected surfaces is not the main driving force of Covid-19 (CDC; Goldman E., 2020; Pedreira, A., Flood, Y., & García, M. R., 2021). For this reason, exaggerated surface cleaning has been criticized as a show of hygiene, primarily giving a false sense of security against the airborne pandemic (Thompson D., 2021). The Covid-19 virus is resistant enough to remain active for days on dry surfaces. Therefore, the virus can remain on surfaces that have been touched long enough to spread to new individuals. The duration the virus can survive depends significantly on the type of surface, temperature and humidity.

The Covid-19 virus dies rapidly when exposed to ultraviolet sunlight, in other words, sun-exposed areas can be considered to be under natural protection. Like other enveloped viruses, Covid-19 survives longest when it is at room temperature or lower, and relative humidity is low (<50%) (Bueckert M., Gupta R., Gupta A., Garg M., Mazumder A., 2020). The virus can remain infectious for several days or even for about a week under ideal conditions at room temperature on many surfaces, such as glass, some types of plastics, stainless steel, and leather. The virus also usually dies after a few hours on some surfaces, such as cotton fabric and copper (Bhardwaj, R., & Agrawal, A., 2020). The virus dies faster on porous surfaces than on non-porous surfaces due to capillary action in the pores and faster spray droplet evaporation (Chatterjee, S., Murallidharan, J. S., Agrawal, A., & Bhardwaj, R. 2021). For instance, surgical masks provide protection thanks to their porous structure. The CDC says that in most cases, cleaning surfaces with soap or detergent rather than disinfecting is sufficient to reduce the risk of contamination. Areas used by sick people indoors and common use products should be disinfected (CDC, 2020).

However, it can be said that the surfaces in open areas are under natural ventilation and UV protection. The lifetime of the virus is generally shorter on porous materials (e.g. tissue, fabric) than non-porous materials (e.g. metals and plastics) (R. Suman, M. Javaid, et al, 2020; N. van Doremalen, T. Bushmaker, DHMorris, et al, 2020).

Most anti-viral polymeric materials are applied as surface coatings and do not significantly alter the bulk properties of the substrates. When used as coatings, antiviral polymers are non-polar bonded (e.g. overpainted), antiviral polymeric materials and their active parts are exposed to the environment and therefore must be resistant to degradation by humidity, temperature and UV exposure, as well as abrasion and erosion. Along with the global Covid-19 pandemic, the increased use of polymer composite materials in 'high-contact' products underscores the need for emerging anti-viral surfaces. As the surface of composite products is often polymer-rich, many viruses, including SARS-CoV-2, are unlikely to survive on these surfaces for long, thus aiding indirect transmission of viruses. The SARS-CoV-2 global outbreak sends a strong message to the polymer composites community that opportunities exist for the creation of next-generation materials with virus-resistant surfaces (Mouritz, A. P., et al., 2021).

Carrier droplets of viruses smaller than 5 μm can be spread from an infected person to an uninfected person through the air. In this case, there are two main ways to stop this spread by practicing social distancing or wearing a mask, which can mainly be improved with a Polymer Nano Composites (PNC) layer. Carrier virus drops of more than 5 μm can accumulate on parts of the human body, such as hands, to indirectly spread the virus in the event of contact. Polymer Nano Composites (PNC) can be a crucial obstacle to the spread of pathogens by forming a barrier at the product-product and product-human interface (Jawad, A. J., 2020). In the spread of the Covid-19 virus, the risk of airborne transmission is high when infected people violate the distance protection in social gatherings, even in open spaces. Since contaminated surfaces have an indirect effect in the spread of the Covid-19 virus, they must be disinfected. As it is difficult to detect this or to clean all surfaces,

it is important to use new materials such as Polymer Nano Composites (PNC), which are effective in virus spread on surfaces.

When choosing an outdoor seating element, it is important to maintain its function as much as the location and design. The expectation of reducing and cleaning away the risk of virus transmission with the effect of the pandemic requires additional practices and different approaches. With the impact of the pandemic, necessary changes have been observed in existing traditional seating elements. Together with maintenance cleaning processes, this situation has revealed the necessity of new quests in the production method and material preference.

4. Research Findings

After the literature review was compiled in the article, criteria for the pre-pandemic and post-pandemic seating elements were evaluated. The seating element criterion level was evaluated as (+) decreased-low level, (++) medium-stable, (+++) increased-high level.

5. Discussion

In addition to their attractiveness, the problems of cities with increasing population density are on the rise. The pandemic has forced us to reconsider social urban designs. The increased use of public outdoor spaces, which are urban vacancies, has made these areas more important. With the pandemic, these areas have been found to be effective in the treatment as well as controlling the spread of pathogens. It can be said that as the effect of the distance between people and the time they spend immobilized in the wake of the pandemic is known, the possibility of the occurrence of these conditions in outdoor urban spaces poses risks in regards to seating elements. This situation creates a contrary situation between pre-pandemic and post-pandemic seating element design. Prepared in accordance with information obtained from the literature review, an attempt was made with the findings table of this article to determine the differences and the impact levels before and after the pandemic, i.e., 'Seating Element Location' (Choosing the location), 'Usage Typology' (Design) and 'Usage Duration' (Maintenance).

In the evaluation criteria of the 'Seating Element Location' choice, it was determined that environmental conditions such as Visual Access, Solar Protection, and Airflow / Wind Impact have not changed with the pandemic. In reducing the spread of the pandemic, isolation of the infected is a priority as the risk of viral emissions increases and it is crucial to prevent contact between people. As a solution suggestion, increasing social distance provides a decrease in the preference for social interaction and the sociopetal seating arrangement, while the preference for the sociofugal seating arrangement increased. This situation has been updated as the distances in the human and surrounding spacing intervals (Proxemics) have gotten further. In the post-pandemic period, the placement of seating elements in such a way to gain more benefit from the impact of ultraviolet solar rays has become one of the important criteria for the fact it provides anti-viral benefits.

In the 'Seat Element Design' evaluation criteria, the pandemic has no impact on the technical supplementary function availability, ergonomic/physical criteria, the use of armrests to provide access support, vandalism and resistance to weather conditions. While the number of users in the bench-type seating element is reduced due to; the presence of additional social functions, the presence of back supports, and the large contact surface on armrests due to the risk of pandemic, it is observed that the effect of users adjusting their distances with the continuous type seating element, the separator function of the armrests and the color preference which influences people's psychological state is significant. If the seat is shared, there is a change in the length of the space remaining between the users. iI is unnecessary to greatly alter the design of seating elements with the effect of the pandemic. Nevertheless, the need for increasing the distance between users and creating barriers may require stylistic differences. With a flexible design approach, it can be foreseen to work on more mobile solutions in seating elements.

In the 'Seating Element Maintenance' evaluation criteria, the pandemic plays no part in the preference of features such as ease of repair and replacement, inflammability, glossy surface in material preference and non-transmission of rapid heat change. Expectations increase in regards to

Seating Element Site Selection Criteria	**Pre-Pandemic**	**Post-Pandemic**	**Seating Element Site Selection Criteria**	**Pre-Pandemic**	**Post-Pandemic**
Visual access	**++**	**++**	Social interaction	**+++**	**+**
Sociopetal seating	**++**	**+**	Sociofugal seating	**++**	**+++**
Solar protection	**++**	**++**	Exposure to Solar /UV impact	**+**	**+++**
Air flow /Wind impact	**++**	**++**	Viral emission	**++**	**+++**
Close distance	**15-45cm**	**15-100cm**	Personal distance	**45-120cm**	**100-200cm**
Social distance	**120-360cm**	**200-400cm**	Public distance	**360-760cm**	**400-1000cm**
Distance to pedestrian traffic flow	**At least 60cm**	**At least 200cm**	Seating elements array spacing	**60cm -50m**	**2 – 50m**
Seating Element Design Criteria	**Pre-Pandemic**	**Post-Pandemic**	**Seating Element Design Criteria**	**Pre-Pandemic**	**Post-Pandemic**
Bench type seating element (3 people)	**+++**	**++**	Continuous type seating element (Multi-use)	**++**	**+++**
Teknik ek işlevi bulunan (Saksı, aydınlatma v.b.)	**++**	**++**	With social additional function (F & B, stop)	**+++**	**+**
Ergonomic/Physical criterion	**++**	**++**	Vandalism and weather resistant	**++**	**++**
Having back support	**++**	**+**	Use of armrests to provide access support	**++**	**++**
Increased contact surface of the armrests	**++**	**+**	Separator function of armrests	**++**	**+++**
Minimum distance adjacent to sitting area	**10-40 cm**	**100cm**	Color preference effective on people's psychological state	**+**	**++**
Seating Element Maintenance Criteria	**Pre-Pandemic**	**Post-Pandemic**	**Seating Element Maintenance Criteria**	**Pre-Pandemic**	**Post-Pandemic**
Ease of repair and part replacement	**++**	**++**	Separator function of armrests	**++**	**+++**
Easily disenfected	**+**	**+++**	Easily cleaned	**++**	**+++**
Porous surfaces	**+**	**+++**	Shiny surfaces	**++**	**++**
İnflammable	**++**	**++**	Does not conduct rapid heat exchange	**++**	**++**
Preferred materials	Wood, Metal, Concrete	Polimer Nano Composite (PNC)	Anti-viral protection	**+**	**+++**

Table 7. Seating element evaluation criterion. This table was developed by the authors.

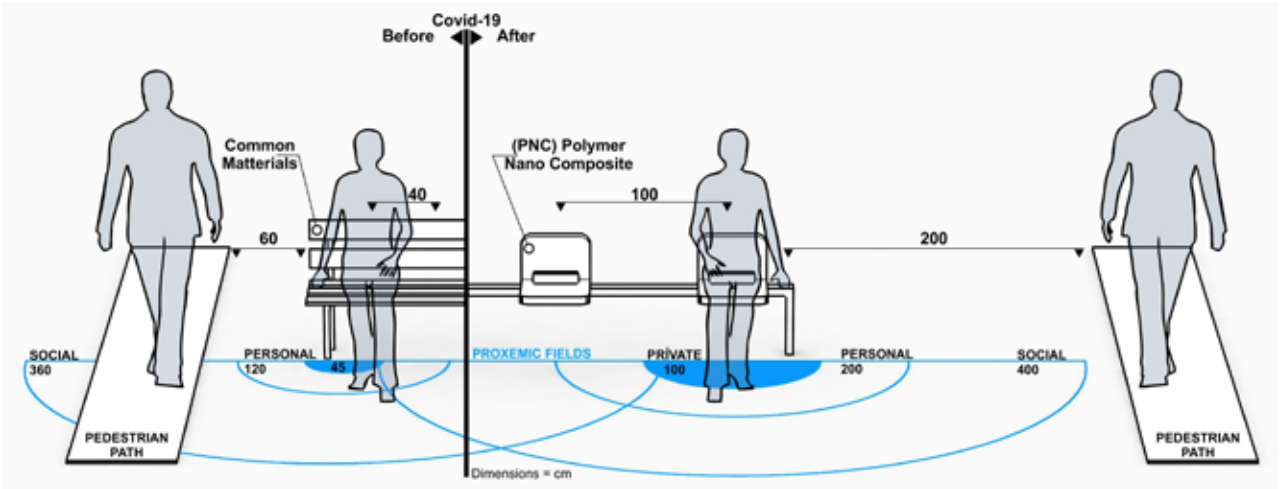


Figure 4. Seating element evaluation image, pre- and post-Covid-19. Images prepared by the authors.

being easily cleaned and the separator function of the armrests. The same is valid regarding seating elements being disinfected to a much higher degree than before the pandemic and have anti-viral protection. In order to reduce the area of the disinfection process, an attempt to impose measures regarding barriers in sitting areas. This situation has reinforced the need for the use of self-disinfecting products. The virus is known to expire faster on porous surfaces than on non-porous surfaces due to capillary action in the pores and faster spray droplet evaporation. The preference of using materials such as wood, metal and concrete before the pandemic may give way to new materials such as Polymer Nano Composites (PNC), due to their effective anti-viral properties in the post-pandemic era.

By maintaining recommended distances, the positioning of seating elements prevents airborne spread from infected people. In the design of seating elements, there is the necessity to increase the barrier or distance in case of user sharing. In case the virus accumulates on the seating element, it can infect parts of the human body, such as hands, to indirectly spread upon contact. Anti-viral materials such as Polymer Nano Composites (PNC) can be developed to constitute a crucial barrier in the spread of pathogens by forming a barrier at the product-user interface.

Moreover, it has been noticed that existing urban seating elements don't have flexible structures compatible with sudden changes such as pandemics. Although healthy urban studies have been conducted for a long time, it has been revealed we don't think we have forgotten the relationship between epidemics and the city, as they don't provide the desired effect. it has been observed that for instance, outfitting cities with one-way designs centered on socialization can render cities useless in the face of a crisis. The pandemic has reminded us that design should be created with multi-dimensional thinking in mind. In short, the bench design as we know it, has to change.

Conclusion

The pandemic has manifested a conflict between designs that tend to increase socialization and measures to reduce it. As the importance of outdoor urban spaces has increased, we encounter the necessity to update plans and designs. Although the surfaces in outdoor spaces feature natural ventilation and UV protection, seating elements that cause the probability and duration of contagious viral contact may pose risks. As a result of this study, it was determined that the location selection and maintenance criteria gained importance, particularly in the outdoor seating element, an attempt of which was made to harmonize with temporary solutions during the post-pandemic era, whereas there was

no significant difference in the design criteria. The impact of the pandemic has altered the hygiene and distance criteria of seating elements, which had been formulated by social, sharing and security criteria during the pre-pandemic era.
In terms of site selection and maintenance during use, outdoor seating elements have been highly affected by the pandemic, whereby this varying situation needs to be reconsidered. Seating element designs have been affected relatively insignificantly by the pandemic. Nevertheless, it is expected that seating elements shall offer mobile sharing amongst users and be flexible in the face of change. In the end, boosting the comfort of usage of outdoor seating elements can be ensured by supporting with case studies specific to the subject of this article.

Conflict of Interests
The authors declare no conflict of interests.

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