The Changes in Public Open Space Usage and Perceptual Urban Design Qualities After the COVID-19 Pandemic

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ABSTRACT

The COVID-19 pandemic that just passed has sparked widespread discussion about how the pandemic teaches new knowledge in the design of urban public spaces. Since the emergence of urban design theories for public open spaces, urban design has encouraged people to leave their homes for activities. However, the pandemic has threatened people's outdoor activities. The perception of public space is an important research area for designing quality cities that create comfortable and safe places for the community. It can determine what should be designed and how it should be designed. Therefore, this study aims to examine changes in people's perceptions of urban public open space usage and people's preference for urban design qualities for the sustainability of streets as public open spaces after the COVID-19 pandemic. Data collection applied an online survey method using questionnaires distributed among people in Malang City, Indonesia. One hundred and eight respondents participated in the survey. The questionnaire investigated the changing use of public open spaces and the most frequently visited public spaces before and after the pandemic. The study also explored the impact of the pandemic on people's preference for urban design qualities: enclosure, legibility, human scale, transparency, complexity, coherence, linkage, imageability, and social life. This study applied descriptive statistics and paired samples t-test to analyze the data. Results indicated significant changes in people's perceptions of urban public open space usage after the pandemic. The study also found significant differences in people's preference for urban design quality, especially the enclosure quality and the social life aspect of the public space.

1. INTRODUCTION

There is unpredictability about how the COVID-19 pandemic will impact the design of public open spaces, the use of space, and public perceptions. Many academics and public observers are discussing essential questions about how the pandemic teaches us new knowledge in the design of urban public open spaces, such as the design of streets for pedestrians. Even lessons from global experience will make us rethink how we build and redesign our cities [1-3].

The life of a city can be seen from the hectic community activities outside the home. Community activities that appear prominent in urban areas occur in urban public spaces. Modern public space was born in the 19th century when city dwellers strolled the boulevards of Paris, London, or Barcelona to enjoy the city. They are interested in walking in the commercial area, for example, because of the beauty of the storefront's appearance on the building facades. At the same time, they also enjoy the presence of other people. These types of outdoor activities in urban areas, namely shopping, walking, and socializing, are the activities that seem to be most affected by the COVID-19 pandemic. In other words, the pandemic threatens the outdoor activities of urban communities, which have brought people out of their homes to engage in activities in the city since the beginning of the emergence of urban design theories for public spaces [3]. The COVID-19 pandemic has caused a decrease in pedestrian activity in urban areas.

Malang City, located in Indonesia, has also experienced this situation. Malang City, the second largest city in East Java, is known as a historical and tourist city. Historically, during the Dutch colonial period, Malang City was known as an apple plantation and sugar factory city, so the city became Dutch officials' settlements. Therefore, the city was a busy tourist destination before the COVID-19 pandemic hit the country in March 2020. Since then, the city has become quieter, with no tourists and public activities in the urban open spaces. The people of Malang have been struggling due to the pandemic. This situation has affected the use of public spaces and the way people perceive urban design. Therefore, this research chose Malang City as a case study site.

The urban design aims to create places where people feel welcome, comfortable, and safe. For this purpose, the perception and preference of urban public spaces is an important research area [3-5]. A study of people's perceptions may determine what should be designed and how it should be designed. However, this pandemic threatens to change our relationship with these public spaces, especially when other

people are present in those places. The decrease in pedestrians in public areas has caused people to rethink their cities as more comfortable, safe, and healthy places to live. Even in the study conducted in the UK, most people want a permanent change, while only 9% of respondents want to return to the normal situation they were in before the pandemic [3].

Based on the current conditions and situation, COVID-19 allows city planners and designers to free up more street space for pedestrians and cyclists and design greener cities [6, 7]. At the start of the pandemic, discussions arose about the need to widen pedestrian paths and redesign pedestrian crossings to provide adequate distance between pedestrians [8]. Big cities like New York are already talking about this kind of change. Milan was even the first to announce permanent changes in widening pedestrian lanes, building new lanes for cyclists, and reducing lanes for motorized vehicles [3].

However, the need to redesign the streets is not only because it fulfills the requirement for physical distancing. From various studies revealed worldwide, measuring changes in the use and perception of urban public spaces in recent months will be critical to future urban planning and design. For example, public areas, such as pedestrian spaces in streets, will still exist after the COVID-19 pandemic, but for whom and for what?

Our future city does not just happen. The future city resulted from the negotiation of interests, strength of relationships, priorities, and decisions that shape the public sphere. We hope that the city's public spaces in the post-COVID-19 pandemic will remain valuable and provide opportunities for the community to socialize, have recreation, and form a community and identity. Given the speed, scale, and diversity of transformations worldwide, measuring changes in perceptions of urban public space usage and preference for urban design quality after the pandemic will be critical to future cities' planning and design. People's perceptions and preferences of the city's public space and urban design quality are significant factors in the city's future.

Because the COVID-19 pandemic has just ended, studies on the pandemic impact on urban public open space usage still need to be expanded in number. Even people's preferences for urban design quality have yet to be studied. Therefore, this research is intended to fill this gap. This research is designed to examine whether there are significant changes in the use of public open space after the COVID-19 pandemic and to explore changes in people's preference for perceptual urban design quality due to the pandemic. Thus, the results of this research can provide implications for urban public open space design following changes in public open space usage and people's preference for urban design quality after the pandemic so that future development can achieve sustainability of urban public open space.

1.1 Urban public open space

Public space is an area with a general right of use for everyone in society [9]. From an urban design perspective, the definition of urban public space is based on ownership identification. When viewed from urban space, which includes the suburbs, to the city center, the urban area contains semi-urban space or the space around the city and spaces within the town [10]. They further concluded that the surrounding spaces of the city are usually used as industrial areas, rural areas, agricultural areas, and recreation centers. All these types of space refer to the space around the city, the semi-urban area.

Meanwhile, urban spaces are most densely packed with people, vital for human activities, and usually areas close to the city center that reflect urban life. They are the spaces for the city citizens' actions and the community gathering place, consisting of private and public spaces. Private space refers to individuals, business groups, or specific land ownership. In contrast, public space is used by the public and is usually managed by the government or a business entity.

In the context of urban design, the city's public space has a physical form that distinguishes it from the surrounding areas. A public space like this has an impression of the enclosure. It can be in the form of buildings and landscapes to give the impression of space, although in an open space [11].

Meanwhile, in urban planning, public space has evolved into open space, understood as outdoor space, such as streets, plazas, and other open spaces. From the perspective of urban planning, the city's public space is a space dedicated to the public, which is located close to city dwellers as users of public space [10]. This study uses a city planning perspective, which views public space as the most accessible open space for city dwellers and is used in city dwellers' daily lives, namely streets. During the COVID-19 pandemic, streets were public spaces avoided by the public, resulting in a sharp decline in pedestrians.

1.2 Street as public space

The street as one of the public open spaces [10] with views along the side of the road is crucial in determining the character of a city area. Most people pass through the streets of urban areas in their living environment and on their way to work, school, shops, and recreation [12]. We spend much time as pedestrians in downtown, commercial, and residential areas. Therefore, it is unsurprising that the character of the streets and their surroundings significantly impact the quality of life of its people [12, 13].

The street is a "closed" space caused by buildings, trees, walls, or a combination of these elements, which function as a movement infrastructure [14]. One form of the street is a corridor, a movement space in the linear form. Streets in urban areas are the most accessible public spaces widely used by the public. Besides functioning as a transportation infrastructure, the street also serves as a social space [15, 16]. Therefore, the street's appearance can affect the community's social life. Humans like a beautiful environment and have characteristics that make the environment memorable and easy to remember. This kind of environment will invite people to enjoy and have activities in the street.

To accommodate this, city planners and designers pay special attention to the quality of the environmental design of the street so that the street has a specific character and attractiveness quality for pedestrians to carry out activities in urban areas. However, after the COVID-19 pandemic, will people still pay attention to the visual quality of urban street designs? Or do they no longer consider them as important as an attraction for an area to be active in it? Therefore, this study emphasizes the environment of pedestrian paths in streets as a city public space because of its significant influence on the people's experience in urban areas.

1.3 The role of perceptions and preferences in urban design

It is often said that nothing is more certain than change. Change helps to ensure the sustainability of the life of every

built environment system and the natural environment. In the urban environment, change is seen as the lifeblood of the economy and social system that supports people's lives as the built environment accommodates activities [17]. Change itself, or at least the consequences of change, also pleasures the community because, after all, city dwellers can adapt themselves in the face of any changes [18]. However, people also often must bear the burden in an environment with poor physical environmental design quality [19].

The appearance of a physical environment is not straightforward because, visually, the physical environment is an abstract aesthetic phenomenon. The quality of urban design depends on the perceptions and preferences of users and observers. In other words, the perceptual quality of the area depends on the evaluation of those who gain spatial experience by doing activities in the region [20, 21]. When asked, people may be united in their distaste for the transformations that have taken place in the city recently [22].

The importance of community participation in planning the development of urban public spaces has long been a concern of researchers. They emphasize that sustainable development is only possible with the community's involvement at different levels. Literature review shows a growing trend in scientific studies to involve community ideas in regional and urban development planning. In this case, researchers and experts agree that community participation is mandatory to achieve sustainability in development [23].

However, although community participation in developing and structuring public spaces is essential, it faces various obstacles. Among them are different user groups and the lack of knowledge that the community has about planning and designing public spaces [24]. Therefore, there needs to be a comprehensive solution to address the fundamental problems involving community participation in urban design [25].

One alternative solution for community involvement in the planning and designing of public space areas is to apply passive participation. Suppose direct or indirect intervention from the community is a form of active community participation, then exploring community perceptions and preferences of the physical environment and development policies can be considered passive community contributions to the planning and design of an environment or area [25]. This participation is expected to bridge and overcome the problems that are widely expressed in the literature regarding the crucial difference between the perceptions and preferences of professionals and the public's perception, preference, and evaluation of an urban area, which is often the cause of failure in development in urban public open spaces [25].

2. METHODS

This research applied a quantitative approach conducted in Malang City, the second-largest city in East Java, Indonesia. The study evaluates changes in people's perceptions of urban public open space usage before and after the COVID-19 pandemic. It also means exploring the people's preference for perceptual urban design qualities of public open spaces for the sustainability of the city's public open spaces after the COVID-19 pandemic.

Data was collected through an online survey using a questionnaire in a Google form. This study conducted an online survey because the situation after the pandemic has not made it possible to do so offline. Indonesia is one of the

countries that has been the slowest to overcome the COVID-19 pandemic. At the end of 2022, when other countries have opened their public spaces, and people are accessible without the need to wear masks in city public spaces, Indonesia was still massively struggling to overcome the pandemic, which has not yet ended completely. Due to this, most people still wear masks in public spaces in the city, and they avoid the crowds.

Consequently, the urban public open areas experience a lack of visitors. And among the limited number of visitors, people refused to participate in this research by filling out a questionnaire offline. Therefore, the questionnaire was distributed online. However, this online survey will not influence the research results because the survey is based more on the opinions and experiences of respondents before and after the pandemic.

The population in this study is all people living in Malang who have access to social media and other digital platforms that allow them to participate in the study. One hundred and eight respondents participated in the survey.

2.1 Instruments and variables

The main instrument in this research is a questionnaire in the form of a Google form. The questionnaire in this study is an anonymous questionnaire (to maintain the privacy of the respondents), which consists of three parts: The first part of the questionnaire is used to explore the personal characteristics of the respondents composed of the variables of age, gender, education, economic level, marital status, and occupation. This first part of the questionnaire used closed-ended questions using a check box. Respondents were asked to choose and check the answer box that suits their situation and conditions. For example, the education variable measures the respondent's education level; the occupation variable measures the respondents' job status, working or not working (because they are students, housewives, or still looking for a job). Those measurements can be seen in Table 3 in the results and discussions section.

The second part of the questionnaire explores residential characteristics: home ownership status (measures whether the respondent lives in the house as tenant, house owner, or any other status); residential type where the respondent lives (whether it is a gated community, a house, or a flat); residential location (to identify in which district the respondent lives in Malang city); length of stay in Malang city (to determine how long the respondent has been residing in Malang city). These data are essential to measure respondents' familiarity with Malang City.

The third part of the questionnaire explores people's perceptions of public open space usage and their preferences for urban design qualities. It evaluates the use of urban public open spaces and the quality of the urban design of the streets as urban public open spaces, consisting of check boxes and closed-ended questions in the form of multiple rating scales and Likert Scale, as mentioned in Table 1.

Table 1. Research variables

Concepts	Variables	Measurement Technique
Public open space usage	The public open spaces in mind	Check box
	Public open spaces frequently visited	Check box

	before and after the COVID-19 pandemic	
	The most avoided public open space during the COVID-19 pandemic	Check box
	Frequency visiting public open spaces before and after the pandemic	Multiple Rating Scale
	The frequency of walking on the street as a public space before and after the pandemic	(Seven-point Scale)
Recreational usage of public open space	The most preferred public open space for recreation before and after the pandemic	Check box
Urban design qualities in public open spaces most frequently visited before and after the pandemic	Enclosure Legibility Human Scale Transparency Complexity Coherence Linkage Imageability Social Life	Seven-point Likert-scale 1=Strongly disagree 7=Strongly agree

*Developed from [16, 19, 26-28]

In measuring urban design quality, nine variables are used: enclosure, legibility, transparency, human scale, complexity, coherence, linkage, imageability, and social life [16, 19, 26-28]. The indicator variable used to measure enclosure is the quality of a closed street characterized by the row of the building and the trees around it. Legibility is measured based on the clarity of the place. Human scale is measured through five indicators: the proportion of building height and humans, sidewalk canopies, large front yards, signage and billboard size, and tree height and branches. The transparency variable is measured through two indicators: the building façade's openness and the building materials' transparency. Complexity is measured by building style diversity. The orderly visual layout and harmony of the road corridor environment measure coherence. Linkage is measured by three indicators: continuous pedestrian path, visual linkage, and spatial linkage. Imageability is measured by distinctiveness, landmarks, and ease of recognition and memorization. Finally, the social life variable is measured by four indicators, namely street crowds, street vendors, street benches, and bench arrangements.

2.2 Analysis techniques

Statistical analyses examined urban public open space usage and people's preferences for perceptual urban design qualities before and after the COVID-19 pandemic. This research employed descriptive statistics, namely mean score and frequency distribution analysis. Frequency distribution is applied to analyze the use of public open space before and after the pandemic, the characteristics of respondents, and residential characteristics. With these analyses, the percentage of each urban open space usage of all respondents can be determined to identify the changes in the use of public open space before and after the pandemic. Frequency distribution is also used to analyze the percentage of each respondent's characteristic variables. With this analysis, the percentage of respondents for each category can be identified, for example,

the number of male and female respondents, the percentage of each respondent's age group, the percentage for each respondent's education level, the percentage of the respondent's income group, and the percentage of the respondent's type of work. Frequency distribution is also used to determine the percentage of residential characteristics: how many respondents are house renters and homeowners, the percentage of each residential type, and the percentage of respondents for each group of years of residency in Malang City. Apart from that, these analyses also found the percentage of respondents from each Malang City district. This condition is intended to ensure that even though the survey is carried out online, it is hoped that the respondents will come from all five districts in Malang City so that they are expected to be reasonably representative.

Next, mean score analysis is applied to study the perceptual quality of urban design in urban public open spaces. Urban design quality variables were measured with a seven-point Likert Scale. The midpoint of the measurement is four as the neutral point, where an evaluation score of <4 is considered to tend to be harmful, and >4 indicates a trend of positive values.

A paired sample t-test was utilized to determine the changes in people's perception of urban public open space usage and people's preferences for the perceptual quality of urban design due to the pandemic. Paired sample t-test is a statistical analysis technique used to see whether there are similarities and differences between two groups, in this case, before and after the pandemic. Therefore, this study employed a paired sample t-test to determine whether there were differences in people's perception of public open space usage and preferences for urban design quality before and after the pandemic. All analyses were processed by statistical analysis using SPSS software.

3. RESULTS AND DISCUSSIONS

People perception assessment is crucial to exploring possible changes in public open space usage in Malang City after the post-COVID-19 pandemic. Malang City has many public open spaces scattered in the city area, each with different characteristics. This survey explores people's conception of the public open space they know. In other words, what kind of place comes to mind when they mention public open space? Table 2 shows that 77.8% of the Malang community respondents answered that public open space was an urban park, and 19.4% interpreted public open space as a neighborhood park. Of all respondents, only 2.8% stated that streets are public open spaces. Respondents were also asked to write down examples of public open spaces in Malang City. The results show that most respondents answered Malang City Square as an example of a symbol of public open space.

Table 2. The distribution of responses on the interpretation of public open space

Level of Abstraction	The First Thing that Comes to Mind about Public Open Space	Frequency	Percent
1	Urban Park	84	77,8
2	Neighborhood Park	21	19,4
3	Commercial Street	3	2,8
Valid cases		108	100.00

Table 3. Respondent and residential characteristics of the survey respondents

Respondent Characteristics	Frequency	Percent
Gender		
Female	78	72.2
Male	30	27.8
Total	108	100
Age		
17-24	75	69.4
35-34	9	8.3
35-44	3	2.8
45-54	21	19.4
Total	108	100.00
Education level		
High school and below	48	44.4
Associate & undergraduate	15	13.90
Graduate & postgraduate	45	41.70
Total	108	100.00
Income Level		
< 3 million IDR	81	75
3-4 million IDR	6	5.6
5-10 million IDR	15	13.9
>10 million IDR	6	5.6
Total	108	100.00
Working status		
Working	33	30.6
Not working/student	63	58.3
Not working/housewife	9	8.3
Not working/looking for a job	3	2.8
Total	108	100.00
Residential Characteristics	**Frequency**	**Percent**
The property status of the house		
Tenant	51	47.2
House Owner	39	36.1
Other	18	16.7
Total	108	100.00
Type of residence		
Gated community	51	47.20
House	51	48.60
Flats	6	5.60
Total	108	100.00
Duration of residency in Malang		
Less than one year	33	30.6
2-5 year	33	30.6
6-10 year	6	5.6
11-15 year	6	5.6
16-20 year	3	2.8
> 20 year	27	25.0
Total	108	100.00
Residence Districts in Malang	**Frequency**	**Percent**
District Klojen	15	13.9
District Lowokwaru	48	44.4
District Blimbing	9	8.3
District Kedungkandang	27	25.0
District Sukun	9	8.3
Total	108	100.00

The characteristics of the respondents in Table 3 show that most respondents who use public open spaces are in the age range of 17-24 years, a group of millennials who tend to be active in urban public open space activities (69.4%). The educational background of the respondents shows that more than half of the respondents (58.3%) are students.

Malang City has five districts: Klojen, Lowokwaru, Blimbing, Kedungkandang, and Sukun Districts. Respondents came from the five regions, so the respondents represented each region.

Before the COVID-19 pandemic, people visited public open spaces for recreation and leisure. Results in Table 4 show that public open spaces frequently visited before the pandemic were dominated by urban parks (80.6%) and commercial streets (11.1%). In other words, before the pandemic, most of the community often engaged in public open spaces such as urban parks and walked in urban commercial streets. After the COVID-19 pandemic, people rethought gathering in public open spaces with many people. Although the types of public open spaces frequently visited in the pre-pandemic and post-pandemic were relatively the same, their frequency was much reduced. Table 4 shows the frequency of visiting urban parks as public open spaces dropped from 80,6% before the outbreak to 36,1% after the pandemic. The results show that people who used to visit urban parks before the pandemic turned to neighborhood parks and streets around their homes (11.1% and 19.4%, respectively) after the pandemic. Even after the pandemic, 16.7% of respondents who used to visit public open spaces chose not to visit any public open spaces anymore.

Table 4. The changes in the frequency of visiting public open spaces before and after the pandemic

	Frequency of Visiting Public Open Spaces Before the Outbreak		Frequency of Visiting Public Open Spaces After the Outbreak	
	Frequency	Percent	Frequency	Percent
Urban Park	87	80.6	39	36.1
Neighborhood Park	6	5.6	12	11.1
Commercial Street	12	11.1	18	16.7
Neighborhood Street	3	2.8	21	19.4
Not Visiting Public Open Space	0	0	18	16.7
Total	**108**	**100.00**	**108**	**100.00**

The shift in people's mobility patterns from city parks and commercial streets to residential neighborhoods and the streets surrounding their homes highlights the absence of publicly accessible, neighborhood-based open space. The study's findings align with earlier research demonstrating that fundamental city amenities are not easily accessible and that people have long desired them regardless of when COVID-19 became an issue. According to this study, public open spaces within a 15-minute radius can promote micro-mobility, or walking and cycling, while also lowering automobile pollution's harmful effects [29]. According to Bereitschaft and Scheller's [30] research, the pandemic has highlighted institutional and physical infrastructure deficiencies that may enhance public health-conscious design, beginning with public space, transportation, and land use planning. A vital post-pandemic remedy might be providing public open spaces close to residential areas, facilitating inhabitants' exercise and good lifestyle choices [30].

Further analysis indicates that before the COVID-19 pandemic, 30.6% of respondents visited public open spaces once a week (Table 5). However, after the COVID-19 pandemic, only 8.3% of respondents saw public open spaces once a week. Most people did not even revisit public open spaces after the pandemic. On average, the frequency of visiting public open spaces after the pandemic is only once per month. Many factors influenced this drastic decline, one of the most dominant factors changing people's perception of public

open space. At first, before the pandemic occurred, people liked to be in a public area where they gathered with many people because their gathering with many people was entertainment for the community, immersed in the crowd. However, after the pandemic, people felt gathering many people was a "threat" to their sense of security. After the COVID-19 pandemic, people tended to avoid places where many of them gathered. This phenomenon resulted in a significant decrease in the intensity of visits from the people of Malang City to public open spaces.

After the pandemic, the issue of feeling safe has become a socio-economic matter. Still, it also highlights the significance of the "distancing measure" as an indicator of people's attachment to a familiar place [31]. On the other hand, some viewpoints argue that the requirement for city facilities close to residential areas raises development costs and is thought to be more effective in dealing with long-term crises than short-term adaptation [32]. People tend to feel safer in areas they can control during and after the pandemic [33] (Figures 1-8).

Table 5. Preferred streets as public open spaces before and after the pandemic

	Preferred Streets Before the Outbreak		Preferred Streets After the Outbreak	
	Frequency	Percent	Frequency	Percent
Commercial Street	48	44.4	30	27.8
Neighborhood Street	54	50.0	57	52.8
Not Visiting Public Open Space	6	5.6	21	19.4
Total	**108**	**100.00**	**108**	**100.00**
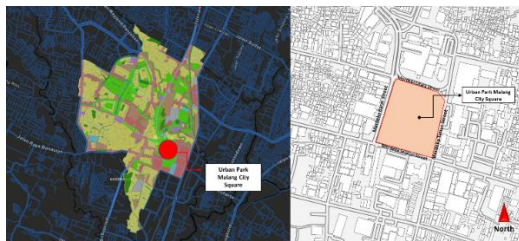
Figure 1. Location of Urban Park Malang City Square

Figure 2. The situation of Urban Park Malang City Square

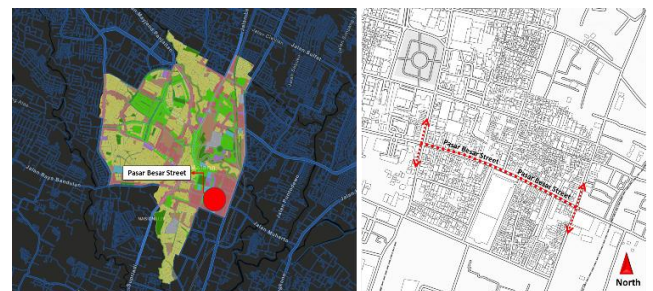**Figure 3.** Location of Ijen Neighborhood Residential Street

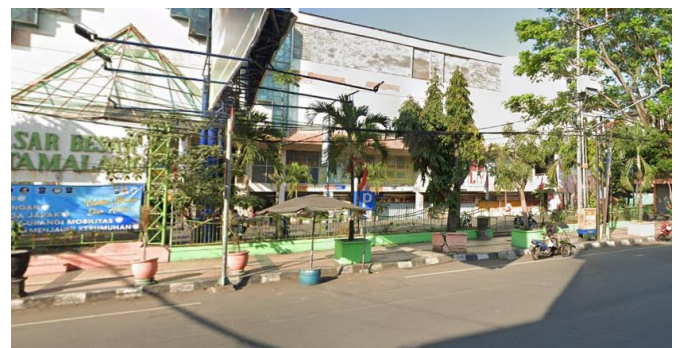**Figure 4.** Ijen Neighborhood Residential Street

Figure 5. Location of Dempo Neighborhood Residential Street

Figure 6. Dempo Neighborhood Residential Street

Figure 7. Location of Pasar Besar Street (commercial street)

Figure 8. Pasar Besar Street

The study findings show a fascinating phenomenon. If urban parks such as the Malang City Square were public open spaces that were most frequently visited by the public before the COVID-19 pandemic, they became the most avoided public open spaces in the city to stay after the pandemic. This phenomenon is because there has been an image in the community that the city's public open space is a gathering place for many people, which is highly avoided during the pandemic. The study results show that most respondents avoid urban park areas (50%) and streets in shopping areas (36.1%). Respondents consider city parks and commercial streets to be usually crowded with visitors, so they are the areas they avoid the most after the COVID-19 pandemic. The results of this research agree that people's movement behavior that avoids commercial places will give rise to socio-economic problems. An area must be on a human scale by integrating green infrastructure with road infrastructure to create a varied urban area to avoid those problems [32, 34, 35].

The popularity of commercial streets as a place for recreation and sightseeing in the pre-pandemic period has also dropped dramatically. Before the pandemic, the most preferred road corridors were commercial streets (44.4% of respondents) and neighborhood streets (50%). However, after the COVID-19 pandemic, there were drastic changes to the community's activities on the streets, especially in shopping areas. Before the pandemic, 44.4% of respondents liked to walk in shopping areas, but after the pandemic, only 27.8% of respondents wanted to keep walking in shopping areas. Meanwhile, the number of respondents who chose not to walk on urban streets after the COVID-19 pandemic has increased dramatically. Only 5.6% of respondents initially disliked walking in urban streets as public open spaces. It grew to 19.4% after the pandemic. This situation shows a change in public perception of the streets as a safe open space for activities. Previous research also recognized changes in this pattern due to the pandemic, so widening pedestrian paths became one of the main focuses of urban design strategies for the future [36]. This situation is supported by other evidence regarding the lack of public open space and city infrastructure [36].

Meanwhile, the changes in street usage as public open spaces are similar in streets in other areas, such as residential areas. Before the COVID-19 pandemic, about 50% of respondents liked to walk on streets in areas other than shopping areas, such as Ijen Street, an elite residential area in Malang City that serves as a car-free day area every Sunday. In that case, in the post-COVID-19 pandemic, around 52.8% still like walking in this neighborhood's residential streets. This situation shows that many people still use public open spaces for their activities at the neighborhood level surrounding their residences. They may visit streets around their residential environment, which they probably do for recreation or sports activities. These findings align with the results of previous research by Finucane et al. [37], who found that neighborhood walkability is the moderator that has the most significant influence due to COVID-19 in reducing anxiety and psychological stress.

The results of further analysis confirm the influence of the pandemic on the frequency of people's visits to public open spaces. The results of the dependent t-test of the frequency of visits before the pandemic and after the pandemic showed a significant decrease in the number of visits from before the pandemic ($M = 4.00$, $SD = 1.34$) compared to after the pandemic ($M = 2.78$, $SD = 1.79$), $t(107) = 5.814$, $p < .001$.

The study results also show a significant change in people's preferences for public open space usage before and after the COVID-19 pandemic. The paired sample t-test analysis of preferences for the use of public open spaces before the pandemic and after the pandemic showed a significant decrease between before the pandemic ($M = 4.75$, $SD = 1.595$) and after the pandemic ($M = 3.03$, $SD = 1.488$), $t(107) = 10.323$, $p < .001$. The same applies to people's preferences for walking in the street corridors. The results showed a change in people's preferences for walking in road corridors before and after the COVID-19 pandemic. The results of the dependent t-test showed that there was a significant decrease in the preference for the use of streets as public open spaces before the pandemic ($M = 4.61$, $SD = 1.521$) and after the pandemic ($M = 3.03$, $SD = 1.421$), $t(107) = 11.141$, $p < .001$. However, with the decline in activities in public spaces, previous research considers this an excellent opportunity to limit the use of private vehicles by reducing parking spaces and a challenge to creating policies to increase walking and cycling activities [32, 38].

The people's preference for the design quality of urban streets as public open spaces is likely also affected by the COVID-19 pandemic. Community activities in road corridors as a form of public open space for walking are influenced by their preferences for street design quality. The preference assessment of the design quality of the street in this study uses nine variables developed from previous studies, i.e., Enclosure, Legibility, Human Scale, Transparency, Complexity, Coherence, Linkage, Imageability, and Social Life. This study evaluated the nine urban design qualities using a seven-point Likert Scale.

The analysis revealed that before the COVID-19 pandemic, the people of Malang liked urban streets that had legibility ($M=5.65$). They have buildings with a large front yard ($M=5.65$) and vegetation with low branches forming the impression of a space canopy on pedestrians ($M=5.44$). People also like a street with an orderly visual arrangement and unity and harmony ($M=5.79$); a continuous pedestrian path ($M=5.91$); has a visual linkage ($M=5.74$); has facilities for pedestrians such as crossing facilities ($M=6.12$). They also prefer streets that have characteristics that distinguish them from other roads ($M=5.82$), have landmarks ($M=5.91$), and have a visual layout that is easy to recognize and remember ($M=6.09$). Social life is also a quality area that provides charm for its users. The design of a street as a public open space is declared successful if much social life occurs in that place so that the street becomes "alive." Before the COVID-19 pandemic, people liked streets with a social life. Before the pandemic, respondents wanted the presence of other people who were busy walking or doing activities when walking down the street ($M=5.18$). In addition, they considered it normal for benches to exist on the sidewalk in the corridors ($M=4.56$), including bench arrangements ($M=4.65$).

In contrast, the study found some urban design qualities of the street that are not preferred by the public for walking. People do not like streets with large billboards or information boards in the corridors ($M=2.15$), building styles that are too diverse and different from each other ($M=3.59$), and a street with many street vendors ($M=3.76$).

The study's findings revealed that people's preferences for the quality of the street design as public open spaces were relatively stable on several variables before and after the COVID-19 pandemic. This stability shows that people's desires before and after the pandemic have not changed much,

as previous research shows that rather than calling post-COVID life a "new normal" culture, it resembles a desire to return to the "old normal" [38]. On the one hand, another opinion says that the pandemic forces the future into a "new normal" culture with an awareness of a future that cannot be speculated on [31]. After the pandemic, people also like to walk on streets that have legibility (M=5.76), buildings with a large front yard (M=5.94), an orderly visual arrangement (M=5.68), and unity and harmony of the visual qualities (M=5.79). People also like a street that has a continuous pedestrian path (M=5.94), a visual linkage (M=6.00), a spatial linkage such as a crossing facility (M=6.18), a characteristic that distinguishes it from other streets (M=5.82), landmarks in the form of buildings and monuments (M=5.82) and has a visual layout that is easy to recognize and remember (M=6.06).

These findings show that people's preferences in several factors of the design quality of public open spaces are relatively similar before and after the pandemic. These findings indicate that the quality of the road corridor as a public open space in some urban designs is relatively unchanged. However, it cannot be denied that several factors significantly change people's preferences.

The change in people's preferences appears in the quality of the enclosure, such as the selection of trees or vegetation on the street side. Trees with low branches and leaves that form a canopy give the impression of a relatively small and closed space, less liked by the community. This situation is most likely because, after the COVID-19 pandemic, people feel more comfortable in large open areas, so the shade that gives the impression of a small and closed space becomes less desirable. These results show people's discomfort with crowded and narrow spaces, thus supporting previous research that what has changed from the effects of the pandemic is the frequency of people and the intensity of activities and events that can be carried out in public spaces [39]. More expansive open space also helps reduce air pollution concentrations for the community by allowing smooth airflow and avoiding direct airborne virus contamination [40]. Apart from that, attractive visual arrangements also help prevent post-pandemic mental problems [41]. Moreover, based on previous research, it is known that apart from enclosure, legibility, human scale, transparency, complexity, coherence, linkage, imageability, and social life, which determine the quality of street design, the pandemic has made us aware that good roads must be flexible and adaptive and consider health aspects [39, 42].

However, the change in people's preferences that appears most prominent is the preference for social life in the streets, especially in the presence of other people who walk or do activities on the streets. This finding supports previous research that the pandemic connects the potential of streets as the primary domain of life [43]. If before the COVID-19 pandemic, people liked a busy road (M=5.18), then after the pandemic, people tended to dislike the presence of other people on the street when they were walking or doing activities in the same street (M=2.59). This condition means people no longer feel comfortable passing others on the sidewalk after the pandemic. Likewise, with the presence of street vendors on the sidewalk, if before the pandemic, people tended to dislike the presence of street vendors (M=3.76), then after the pandemic, people increasingly disliked the fact of street vendors on the sidewalk (M=2.76). The pandemic shows that the regulation of street vendors must be included in urban design strategies based on innovation programs and organized

through public policy so that they can survive in the future [44]. Moreover, because this is related to people's income, it is very likely that after the pandemic, the government will first make the economy its main priority [35].

The existence of benches on the sidewalk in the pre-pandemic period was also less noticed by respondents (M=4.56), which showed a relatively neutral value between liking and disliking. After the pandemic occurred, people paid attention to those facilities. They did not like the presence of benches on the sidewalk. This situation may be due to the decreased sense of safety when they walk on the pedestrian path across people sitting on benches on the sidewalk. It cannot be denied that life after the pandemic will never be the same. This pandemic affects values, life, habits, and architecture [45]. The issue of material hygiene also causes the feeling of security about not sitting on street benches, so people and designers are increasingly considering materials that are easy to clean [45].

Overall, there has been a significant change in the use of public open spaces and preference towards urban design quality after the COVID-19 pandemic. People tend to switch to public open spaces on a neighborhood scale that does not attract many people. Besides that, people are no longer interested in walking on commercial streets. This phenomenon implies the need for an arrangement that provides a sense of security for the community from fears of virus transmission so that the attractiveness of public open spaces can increase. Regarding the quality of urban design, attention must be paid to the availability of a broad and open space experience. Installation of canopies on pedestrian paths or low-shade vegetation should be avoided. As an indicator of the success of urban street design as a public open space because of its vitality, the street social life has become a challenge to remain attractive for people for their outdoor activities.

4. CONCLUSIONS

This research is intended to evaluate changes in the use of public open spaces and changes in community preferences regarding the quality of urban design in streets as public open spaces before and after the pandemic. The research results show a change in the pattern of public open space usage from the city scale to the neighborhood scale or the local scale around people's residences due to people's perception of their sense of security in carrying out activities in public open spaces after the pandemic. After the pandemic, the results also found a decrease in people's preferences for walking or doing activities in city public open spaces, especially on urban streets.

The research results show a change in preferences for the perceptual quality of urban design between before and after the pandemic. Seven of the nine perceptual quality variables of urban design, namely legibility, human scale, transparency, complexity, coherence, linkage, and imageability, did not experience preference changes. Meanwhile, two urban design qualities experienced significant changes in people's preferences: the enclosure quality and social life. People's preference for the quality of street enclosures has decreased after the pandemic. This finding is because the quality of the enclosure gives the impression of a street as an enclosed space with rows of buildings and trees on either side, making it a small outdoor space for activities. Due to the pandemic, people prefer spacious open areas. However, the most prominent

change in preferences is the change in people's preferences for the quality of social life in streets as public open spaces. Before the pandemic, people liked crowds of people doing activities in streets as public open spaces, but after the pandemic, people didn't like crowds or other people's presence in the streets. Likewise, people no longer want benches on the sidewalk where many people sit to socialize. The existence of street vendors, which were less popular before the pandemic, has become even less popular after the pandemic.

The findings of this study provide implications for the need to adjust the design of city public open spaces, especially streets, so that people can feel safe and comfortable walking and doing activities in public open spaces like before the pandemic. Public open space at the neighborhood level also needs to be increased to accommodate changes in public open space usage, shifting from the city scale to the neighborhood scale. Considering that social life is the leading indicator of the success of public open spaces, the results of this research also provide implications for the need to develop theories about how to generate social life in public open spaces, especially streets, after the pandemic, so that people will again be interested in active activities in public open spaces with psychologically feel safe and comfortable in their activities.

However, this is still a preliminary study finding the best policy for future urban public space design after the pandemic. Therefore, future research expects similar studies to find more stable results in finding changes that occur, especially in the design quality of public open spaces, so that future studies can obtain a complete picture of the changes in public open spaces after the pandemic. Furthermore, for the subsequent investigations, it is better to distribute the questionnaires offline, along with the end of the COVID-19 pandemic, so that the participating respondents are representative of the population and the results can be generalized more accurately.

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