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The Needs of Pedestrian Circulation Design for Adolescents In Semarang Old Town Public Space That Responsive To Covid-19 Pandemic

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Abstract. Semarang Old Town is a site in Semarang City that provides economically valuable public spaces that teenagers use. Due to irregular pedestrian circulation and packed economic activity points, Semarang Old Town is a sensitive location for the possible spread of the Covid-19 virus. The Covid-19 epidemic has not been addressed in the public spaces of Semarang Old Town. Circulation flow, circulation signage, crossing points, and health protocol facilities have all been identified as issues. This project intends to develop pedestrian circulation needs for teenagers in an economically valuable public place in Semarang Old Town in response to the Covid-19 pandemic. The quantitative method employed in this study was behavior mapping and quantitative descriptive analysis techniques. The stages are as follows: first, identify teenage features; second, analyze design demands for adolescent pedestrian circulation elements. Then, construct the design requirements and placement. The study was conducted on a group of 41 adolescents aged 12 to 25, with observation taking place on Saturday night and Sunday morning (peak hours). According to quantitative descriptive analysis methodologies, adolescents prefer more simple, more adaptable designs and occupy less space by 57 percent..

Keywords: Public Space, Design Needs, Circulation, Adolescent, Covid-19

INTRODUCTION

Because of its ability to transform the city into a healthy city, public space has become a vital component of the urban ecosystem and a key feature of urban resilience [1]. This space becomes a location for humans to engage in order to meet their requirements as social creatures. When the Covid-19 outbreak struck Indonesia, however, there were numerous regulations and norms in place to maintain social distance between users in public settings. Humans have been urged to stay at home or have been prohibited from moving in public [2].

Public space can become a tourism destination for users. Recreational and commercial activities that can take place in public spaces are intimately linked to tourism destinations[3]. Public spaces with economic point activity can be classified as public spaces with economic value. Because the Covid-19 virus can induce crowds, public venues with economic value are more vulnerable to the infection's potential spread [4]. Many activities that draw large people have the ability to cause spread Covid-19 virus [5]. The crowd is generated by the road corridor's restricted space and the accumulation of excessive activity, which is exacerbated by the existence of economic point activity.

In public spaces, circulation can also be an influential factor in the virus transmission besides the economic point activity. Circulation is a path that brings people to an activity, so access to the activity will be difficult to reach [6]. Circulation must be considered because bad circulation will cause a variety of issues. There will be issues that arise, one of which will be the disruption of activity.

Semarang City is one of the cities with a public space. It is one of the city's destinations for visitors who want to enjoy tourism activities, especially public spaces. When the Covid-19 outbreak reached Indonesia, public activities were hindered. ourism activities in Semarang City attract a large number of visitors, increasing the risk of the virus spreading.

Based on the Semarang Corona Alert Record, as of January 30, 2021, there were a total of 27,023 people and a total of 2,153 deaths. The data above shows that the percentage of Covid-19 cases reached 1.48% of the total population, and the percentage of cases died 7.96% of the total Covid-19 cases in Semarang City. The number of tourists in 2020 in Semarang City reached 3.2 million, which means that there are still many visitors who cause the potential for the spread of the virus during the Covid-19 Pandemic [7]. The following is the scope of the research location:

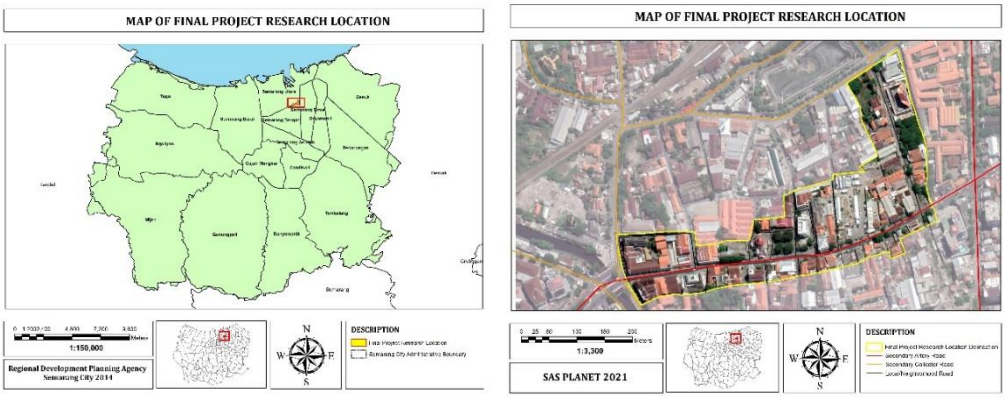


FIGURE 1. The Scope of the Research Location

This research was conducted at Semarang Old Town area, which focused on the corridors of Letjen Suprapto Street and Cendrawasih Street in Semarang City. This location was chosen because Semarang Old Town is one of the favorite destinations and public spaces with economic value that attracts many visitors, especially in the two road corridors mentioned above. Several problems of Semarang Old Town are :

1. Pedestrian Circulation Flow : such as the walking direction is still mixed and irregular at the location
2. Pedestrian Circulation Signage : such as signage that is still rare at the location
3. Pedestrian Crossing Point : such as no crossing point found at the location
4. The Implementation of Health Protocol Facilities : such as no visitor divider in culinary area at the location

The Needs of Pedestrian Circulation Design for Adolescents that Responsive to Covid-19 Pandemic

Topics such as public spaces and the Covid-19 Pandemic can be used to generate ideas for how public places might be designed. The purpose of this study is to determine the design requirements for adolescents to be able to walk safely in public spaces. Pedestrian circulation is a path that takes individuals or persons through road traffic places to reach a specific activity [6]. One of the factors to consider while creating a responsive design is circulation. The design of public spaces in reaction to the Covid-19 pandemic can be regarded as a public space response that incorporates components of addition, alteration, and adaptation to present conditions in order to limit the risk of the Covid-19 virus spreading in public areas [8]. Materials, objects, management, and other features can be incorporated to the design to encourage people to stay active in public places.

The Needs of Pedestrian Circulation Design Aspect That Responsive To Covid-19 Pandemic

This research focused on pedestrian circulation that was responsive to the covid-19 pandemic. Every aspect becomes a solution for every problem in the research location. The following is the focus of aspects in this research, i.e.:

TABLE 1. Pedestrian Circulation Design Needs Aspect

Design Needs Aspect	Design Needs Sub-Aspect
Pedestrian Circulation Flow	1. One-Way Circulation in Pedestrian Ways 2. One-Way Circulation in Entrance/Exit Point 3. Circulation Barrier Between Pedestrian Ways and Economy Activity
Pedestrian Circulation Signage	1. Signage Health Public Spaces 2. Signage in Queue Point 3. Signage in Resting Area
Pedestrian Crossing Point	1. Calm Traffic 2. Safe Crossing
The Implementation of Health Protocol Facilities	1. Hand washer 2. Temperature Check Point 3. Visitor Divider in Culinary Area 4. Concert/Show Parking Area Design

Source : [9], [10], [11], [12], [13], [14]

Sub-aspects can be explained as a solution to design demands during the Covid-19 Pandemic, based on the table above. The movement of pedestrians is separated into two categories: one-way circulation and circulation obstacles. One-way circulation forces people to travel in a predictable pattern. This approach will lessen the likelihood of pedestrians colliding physically [9]. By separating the space between persons walking and economic actors to minimize the physical contact, barriers can help lower the danger of spreading the virus. Second, pedestrian circulation signage is separated into three categories: health public places, queuing points, and rest area. Pedestrians can be aided in their activities by signage that emphasizes the significance of physical separation and expedites circulation during the Covid-19 epidemic [10].

Third, there is a pedestrian crossing point divided into two categories: calm traffic and safe crossing. Because it can speed up pedestrian circulation, providing pedestrian crossing places such as calm traffic and safe crossings can be a sort of responsive public space design [12]. Fourth, the implementation of health protocol facilities, the implementation design of several health protocol facilities is one of the tools that help reduce the potential for the spread of the virus in public spaces. Health protocol facilities will help humans, especially pedestrians, maintain personal health, maintain distance, and prevent virus transmission during the Covid-19 Pandemic [13].

Adolescent As Users in Public Spaces During the Covid-19 Pandemic

Adolescence is a period of great curiosity, likes challenges/adventures, and dares to take risks. Adolescents' perceptions of using public spaces are very diverse, and the majority uses them for physical activities and activities that are interesting to them. Adolescents prefer quiet spaces and good lighting. Some people do not like crowded places and lots of supervision, and the rest like crowded places and places to show something [15]. During the Covid-19 pandemic, adolescent users need to adapt to new community habits when they behave in public spaces. According to the statement above, during the covid-19 epidemic, adolescents had numerous behavioral characteristics and regularly visited places in public spaces, which were categorized into behavior setting and place setting, as shown in the table below:

TABLE 2. Behavior Setting and Place Setting of Adolescents

Behavior Setting	Place Setting
1. Gathering	1. Wide Area
2. Relaxing	2. Good View Area
3. Exercising	3. Dark Area
4. Playing	4. Calm Area
5. Hobby Sharing	5. Culinary Area

Source : [16], [17]

METHODOLOGY

The quantitative approach was used in this study. Quantitative research produces data in the form of numbers and is generally analyzed using descriptive or inferential statistics [18]. This research employed behavior mapping and quantitative descriptive analysis techniques. The behavior mapping analysis technique was aimed to see a place where humans do a lot of activities [19]. Quantitative descriptive research is a method used to describe, explain, or summarize various conditions, situations, phenomena, or research variables according to events that can be photographed, interviewed, observed, and expressed through documentary materials [20].

The survey was conducted on a sampling of 41 adolescents aged 12-25 years and the observation time was Saturday night and Sunday morning (*peak hours*) in the Semarang Old Town. The data were collected by using observation and questionnaires on an adolescent who was active in the Semarang Old Town. Observation was used to map the behavior setting and place setting of adolescents in the location. This observation produced possible habits and places often visited in public spaces by adolescents. Besides that, the questionnaire was used to determine adolescents' preferences towards design needs that have been determined in the form of percentage graphs.

RESULT AND DISCUSSION

The results of observations and mapping on adolescent behavior and frequently visited places show differences in activities that occur on Saturday nights and Sunday mornings (peak hours) in the Semarang Old Town. Here is the explanation:

Saturday Night - Adolescents do more activities and visit the dark area that only exists at night. It is rare to find adolescents who do sports such as jogging and cycling, and many activities are found in the culinary area.

Sunday Morning - Less intensity and amount of activity, and some breathe fresh air and enjoy the atmosphere. Adolescents do more physical activities such as jogging and cycling; only few adolescent activities are found in the culinary area.

The research location found ten characteristics of adolescents based on behavior setting and place setting. The following are the ten characteristics:

TABLE 3. Behavior Setting and Place Setting of Adolescents

Adolescent's Characteristic Typology Based on Behavior Setting and Place Setting	
1. Adolescents who gathering in the wide-area (A.1)	6. Adolescents who relaxing in a calm area (B.4)
2. Adolescents who gathering in the dark area (A.3)	7. Adolescents who exercise in a wide area (C.1)
3. Adolescents who gathering in the culinary area (A.5)	8. Adolescent who playing in the dark area (D.3)
4. Adolescents who relaxing in the wide-area (B.1)	9. Adolescents who sharing hobbies in the wide-area (E.1)
5. Adolescent who relaxing in the good view area (B.2)	10. Adolescents who sharing hobbies in the good view area (E.2)

Source: Author's Analysis

Next is a graph that show the tendency of each adolescent's typology preferences to responsive designs.

Pedestrian Circulation Flow Aspect Design & Placement Adolescent's Preferences

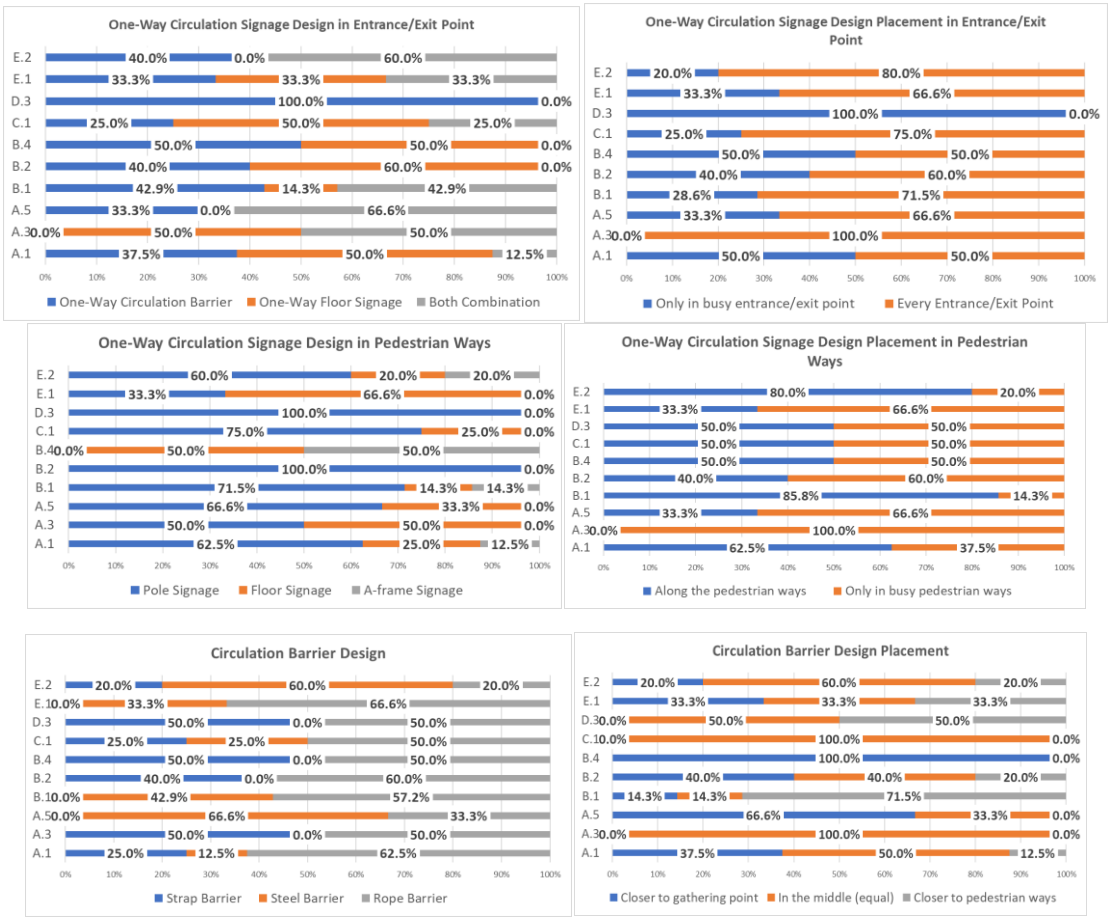
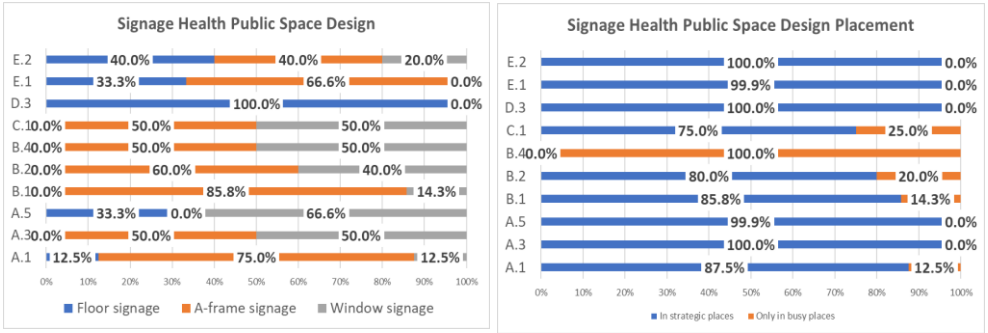


FIGURE 2. Design Needs Adolescent's Preferences (Pedestrian Circulation Flow Aspect)

The graphs of pedestrian circulation flow aspect show that there is a tendency (majority) in percentage form for adolescent users to design and placement preferences of aspect that mentioned in the table 1. The percentage data of the graph obtained from the questionnaire that contains question to answer the design and placement preferences of each aspect and sub-aspect. Which will be explained below:

- **Sub Aspect One-Way Circulation Signage Design in Pedestrian Ways**: a tendency to choose pole signage design and placement along the pedestrian ways based on the answers of 41 adolescents who are divided into ten typologies of adolescent characteristics (table 3)
- **Sub Aspect One-Way Circulation Signage Design in Entrance/Exit Point**: a tendency to choose both combinations of circulation barrier and floor signage design and placement to every entrance/exit point based on the answers of 41 adolescents who are divided into ten typologies of adolescent characteristics (table 3)
- **Sub Aspect Circulation Barrier Design**: the tendency to choose rope barrier design and placement in the middle (equal) based on the answers of 41 adolescents who are divided into ten typologies of adolescent characteristics (table 3)

Pedestrian Circulation Signage Aspect Design & Placement Adolescent's Preferences



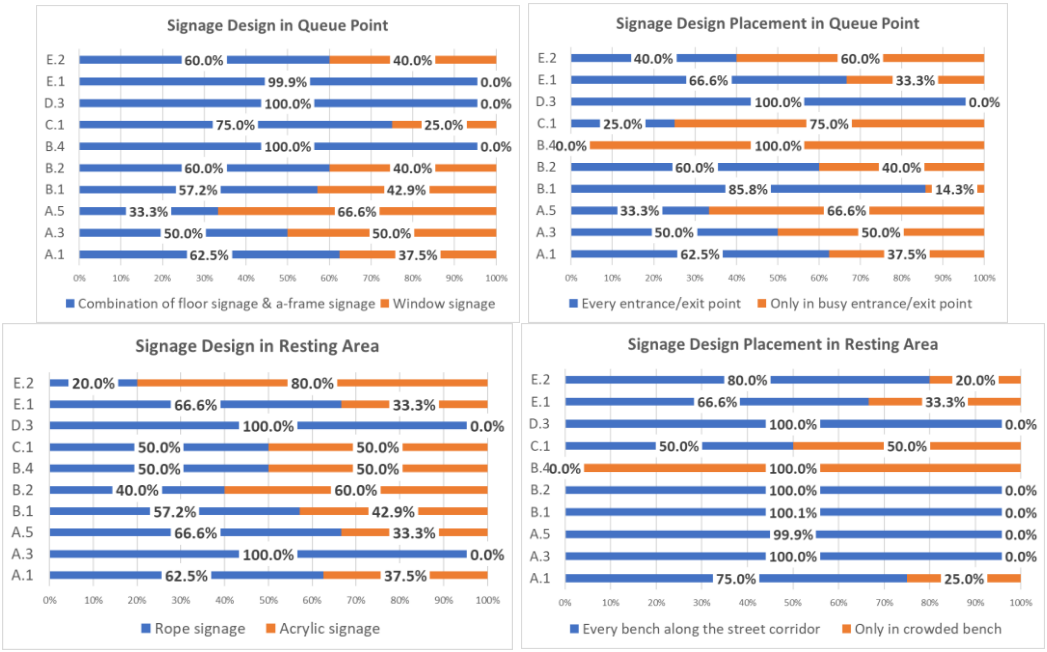
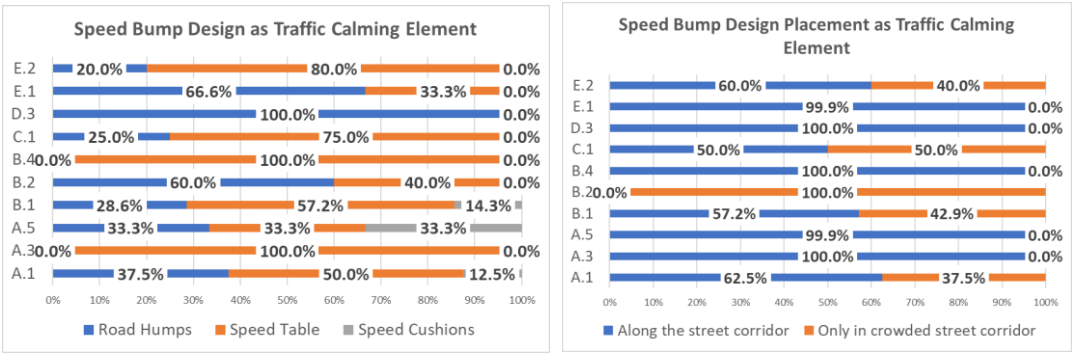


FIGURE 3. Design Needs Adolescent's Preferences (Pedestrian Circulation Signage Aspect)

The graphs of pedestrian circulation signage aspect show that there is a tendency (majority) in percentage form for adolescent users to design and placement preferences of aspect that mentioned in the table 1. The percentage data of the graph obtained from the questionnaire that contains question to answer the design and placement preferences of each aspect and sub-aspect. Which will be explained below:

- **Sub Aspect Signage Health Public Space**: tendency to choose a-frame signage design and placement to strategic places based on the answers of 41 adolescents who are divided into ten typologies of adolescent characteristics (table 3)
- **Sub Aspect Signage in Queue Point**: the tendency to choose both combinations of floor signage and a-frame signage design and placement to every entrance/exit point based on the answers of 41 adolescents who are divided into ten typologies of adolescent characteristics (table 3)
- **Sub Aspect Signage in Resting Area**: the tendency to choose rope signage design and placement to every bench along the street corridor based on the answers of 41 adolescents who are divided into ten typologies of adolescent characteristics (table 3)

Pedestrian Crossing Point Aspect Design & Placement Adolescent's Preferences



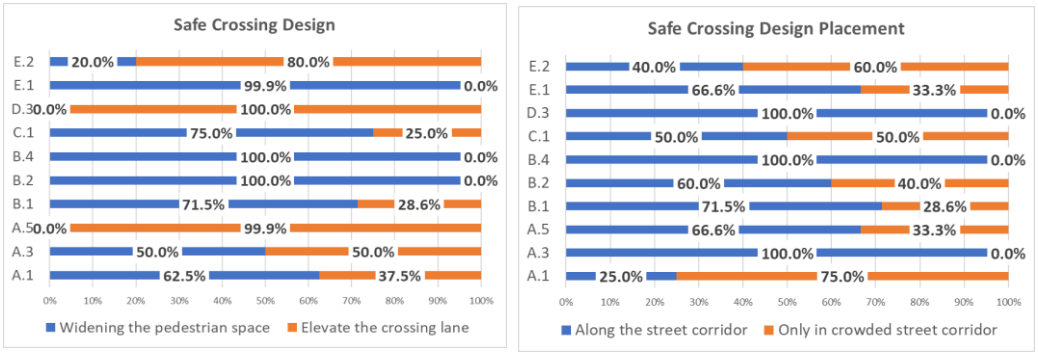
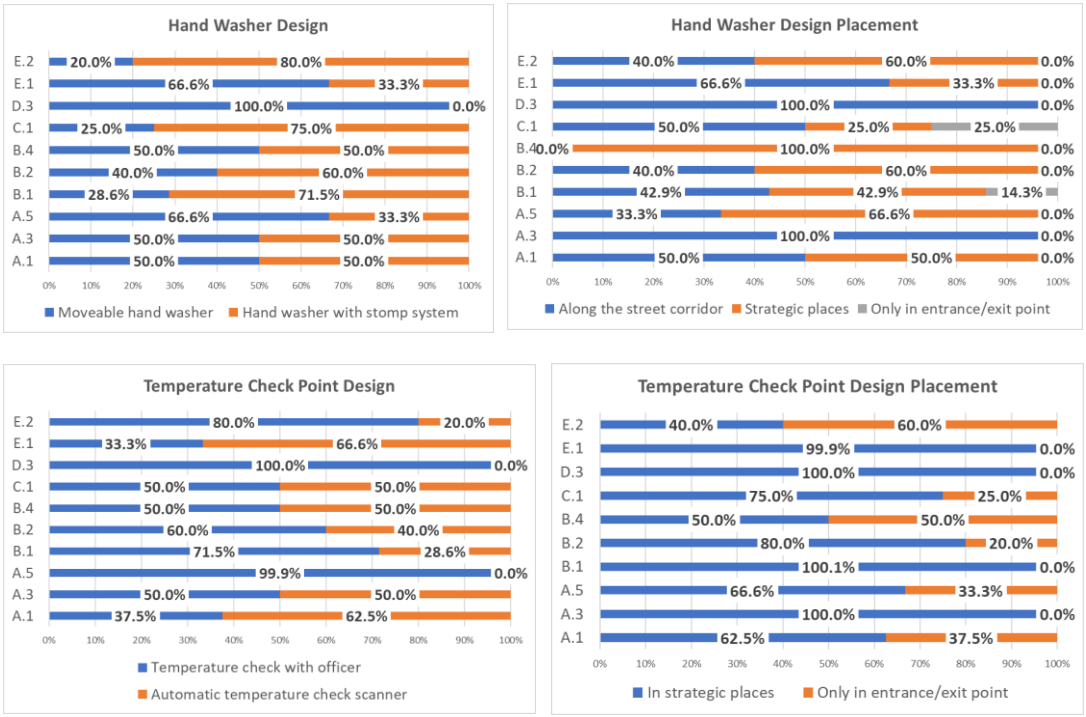


FIGURE 4. Design Needs Adolescent's Preferences (Pedestrian Crossing Point Aspect)

The graphs of pedestrian crossing point aspect show that there is a tendency (majority) in percentage form for adolescent users to design and placement preferences of aspect that mentioned in the table 1. The percentage data of the graph obtained from the questionnaire that contains question to answer the design and placement preferences of each aspect and sub-aspect. Which will be explained below:

- **Sub Aspect Traffic Calming**: tendency to choose speed table design and placement along the street corridor based on the answers of 41 adolescents who are divided into ten typologies of adolescent characteristics (table 3)
- **Sub Aspect Safe Crossing**: the tendency to choose to widen the pedestrian space design and placement to along the street corridor based on the answers of 41 adolescents who are divided into ten typologies of adolescent characteristics (table 3)

The Implementation of Health Protocol Facilities Aspect Design & Placement Adolescent's Preferences



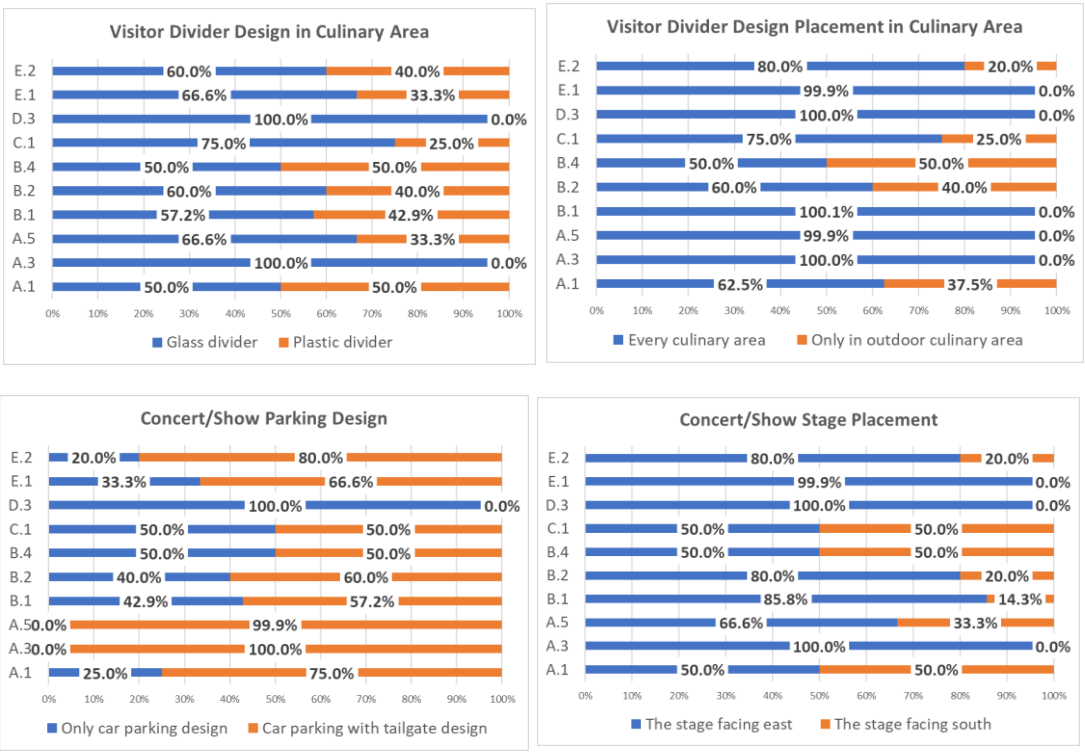


FIGURE 5. Design Needs Adolescent's Preferences (The Implementation of Health Protocol Facilities Aspect)

The graphs of the implementation of health protocol facilities aspect show that there is a tendency (majority) in percentage form for adolescent users to design and placement preferences of aspect that mentioned in the table 1. The percentage data of the graph obtained from the questionnaire that contains question to answer the design and placement preferences of each aspect and sub-aspect. Which will be explained below:

- **Sub Aspect Hand Washer**: tendency to choose hand washer with stomp system design and placement to along the street corridor based on the answers of 41 adolescents who are divided into ten typologies of adolescent characteristics (table 3)
- **Sub Aspect Temperature CheckPoint**: tendency to choose temperature check with officer design and placement to strategic places based on the answers of 41 adolescents who are divided into ten typologies of adolescent characteristics (table 3)
- **Sub Aspect Visitor Divider in Culinary Area**: the tendency to choose glass divider design and placement to every culinary area based on the answers of 41 adolescents who are divided into ten typologies of adolescent characteristics (table 3)
- **Sub Aspect Concert/Show Parking**: the tendency to choose car parking with tailgate design and stage concert/show placement facing east based on the answers of 41 adolescents who are divided into ten typologies of adolescent characteristics (table 3)

Based on the tendency of adolescents towards design and placement, an illustration of the design and placement points can be made at the Semarang Old Town as shown below :

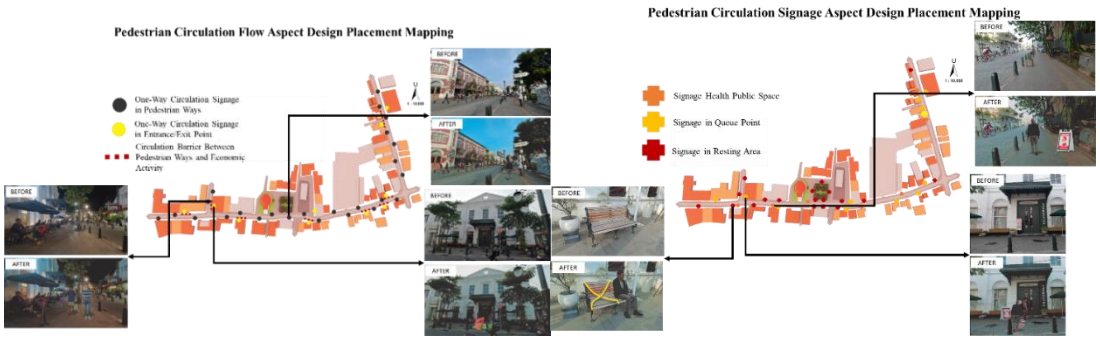


FIGURE 6. Design Needs Adolescent's Preferences Placement Mapping

The figures of design needs adolescent's preferences placement mapping show that preference for the design placement obtained from the graphs. The majority of adolescents choose to place designs in places along the road, the rest choose places that are crowded with visitors and strategic places. This is influenced by several statements in research on public spaces during the pandemic that crowd has a large effect on the rate of virus transmission so that the majority of adolescents choose to designs placement along road corridors [9]. The designs placement can affect the provision of a wider space or a safe place for adolescents who are active in public spaces during the Covid-19 Pandemic.

CONCLUSION

Based on the results data processing and analysis of the design needs preferences of each adolescent typology in Semarang Old Town, several conclusions can be drawn:

- Adolescents tend to prefer more simpler, flexible forms of design and use of smaller spaces, such as rope signage at resting area, handwasher with stomp system, glass divider in culinary area, and rope barriers between pedestrian ways and economic activity point by 57% compared to designs that tend to be more complex and use more space.
- Adolescents tend to prefer more complete signage designs such as a combination of circulation barriers and one-way floor signage at entrance/exit points, then a combination of floor signage and a-frame signage at the queue point by 54% compared to preferences that only use 1 type of design.
- Adolescents tend to prefer directional signage designs in the form of one-way signage on a marker pole whose position is above the pedestrian eye-level and informative signage in the form of a health protocol suggestion on an a-frame board whose position is below the pedestrian eye-level by 61% compared to other types design preferences.
- Adolescents who have activities that tend to be more active such as playing, exercising, and sharing hobbies, prefer the temperature checkpoint with officer design by 64% because it is rated easier and safer in terms of health procedures.
- Adolescents prefer designs that provide more space, such as widening pedestrian space at crossing points and car parking with tailgate design by 63% compared to designs that provide narrower spaces.
- Adolescents tend to prefer designs that are not too tall, friendly enough for vehicles, and effective in reducing vehicle speed, such as speed table as speed bump design by 56% compared to the other two types of speed bumps design.

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