Pedestrian Perception Based on Sidewalk Level of Convenience at Pemuda Street

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Abstract. The city of Jakarta is one of the largest metropolitan cities in Indonesia. Urban development is often oriented towards transportation systems with two-wheeled and four-wheeled vehicles. If there is little space for pedestrians, it cannot provide benefits and advantages for pedestrians. This study uses a descriptive quantitative approach, where data collection is carried out through surveys with observations and questionnaires. Google form-based questionnaires were given to respondents classified according to gender who passed the Pemuda Street pedestrian path, this was due to conditions in the field that made it impossible to meet many people during the Covid-19 pandemic. The sampling technique used in this study was random sampling. The results showed 156 respondents with a percentage of 68.12% of respondents stated that the Pemuda pedestrian path was comfortable for pedestrians to pass. This is supported by several indicator factors, from some of these indicators, it can be seen that the indicators of the surface condition of the pedestrian pathway at Pemuda Street, both men and women, feel comfortable with a percentage of 78.93% and 75.08%, but the indicators of Obstacle / obstruction on the pedestrian pathway Youth, both male and female, felt uncomfortable with a percentage of 52.33% and 49.58%.

1. Introduction
The city of Jakarta is one of the largest metropolitan cities in Indonesia. Apart from being a metropolitan city, Jakarta is also the capital city of Indonesia, where the population in Jakarta reaches more than 10 million. This is because Jakarta is the center of the economy and center of government. For this reason, infrastructure development in Jakarta needs attention given the large number of people left in Jakarta. Development in cities is often oriented towards the transportation system with two-wheeled and four-wheeled vehicles. The space for pedestrians is reduced or even lost if there is one, it cannot provide benefits and advantages for pedestrians. One of the currently neglected facilities is the sidewalk that is intended for pedestrians on foot. Walking is considered to be one of the oldest and most important elements in terms of the mode of transportation as every journey begins and ends with a walk. The condition of the sidewalks plays an important role in increasing the number of walking trips made by pedestrians with excellent standards of safety, safety and comfort [1, 2].

Pedestrians are entitled to the availability of special road facilities for walking activities in the form of pedestrian paths, crossings, and other facilities [3]. The Director General of Land Transportation states that pedestrians are an important form of transportation in urban areas. By having a high level of mobility, and to improve the quality of the city's open spaces, now the City of Jakarta is starting to...
reorganize its city infrastructure, one of which is the pedestrian route or commonly known as the sidewalk [4]. Where improvements in the conditions of roads, sidewalks and maintenance of completeness of pedestrian facilities can provide a level of comfort for visitors, both residents of Bandung City and tourists who come [5]. More specifically, for pedestrians which function as support for shopping tourism activities, the quality of pedestrians also has an impact on economic value. Uncomfortable pedestrian paths can cause travelers to leave the area, so that business people are at risk of experiencing losses [6].

In the city of Jakarta, the sidewalk in the Pemuda area is one of the pedestrian paths that is quite crowded with pedestrians, this is because the area is close to shopping centers, culinary, education, offices, and modes of transportation. The Jakarta city government has built pedestrian paths as best as possible to provide comfort for its users, especially pedestrians. But in reality, pedestrian paths that have been arranged in such a way as for pedestrians are used for selling by street vendors and parking their vehicles on the pedestrian path. So that it makes pedestrians feel less comfortable to pass. Planning for pedestrian lane needs must be well planned according to the rules and standards of pedestrian path planning by considering pedestrian perceptions and preferences and prioritizing pedestrian safety and comfort in order to improve their walking experience and create a sense of belonging and pleasure in walking [7][8]. In terms of the function of the pedestrian is as a forum for humans in terms of pedestrians to be able to carry out activities in the corridor space freely [9].

Factors Affecting Comfort: (1) Circulation; (2) Natural or climatic forces; (3) Noise; (4) Aroma or smell; (5) Shape; (6) Security; (7) Cleanliness; (8) Beauty of space; (9) Lighting. In planning a pedestrian path it is necessary to consider: 1. Balanced interactions between pedestrians and vehicles; 2. The safety factor, sufficient space for pedestrians; 3. Facilities that offer fun along the pedestrian area; 4. The availability of public facilities that are integrated and become a supporting element [10]. The main function of the pedestrian path is to provide services to pedestrians so that it can improve pedestrian smoothness, safety, and comfort [11].

Before this research was conducted, there were several journals and studies that discussed pedestrians perceptions of the comfort level of the pedestrian path, Villaveces, et al. conducted a study on Pedestrians' Perceptions of Walkability and Safety in Relation to the Built Environment. pedestrians, causing a sense of insecurity and comfort in using the sidewalk [12]. Another research, on the Identification of Service Levels for Sidewalks and Pedestrian Comfort in the Regional Government Office Cibinong, Bogor Regency, which states that circulation, with the results of zone 1 presentation analysis, obtained results of 44% showed less comfort, zone 2 obtained results of 41% indicated that it was still less comfortable, and Zone 3 obtained results of 34% indicating that it was still less comfortable [13]. On the other hand, Muchtar conducted research on the Identification of Pedestrian Comfort Levels. Case Study of Kedoya Raya Street-Arjuna Street, South Tangerang. The research was conducted to restore the actual function of the sidewalk, so as to create a safe, comfortable and pleasant atmosphere for the users of the infrastructure [14]. Park and Garcia made a study whose results were shown in the form of proper street lighting as a major contributor to increasing feelings of safety on the road followed by the morphological complexity of roads formed by various types of businesses, outdoor eating places, street singers, and other pedestrian activities. Apart from physical setting, this study also found that age and gender influence anxiety levels among pedestrians [15]. And another study found that the majority of respondents did not like to use sidewalks because of the bad road surface conditions and untidy pathways, while most respondents felt that the side roads were not too wide [16].

After conducting a preliminary survey, it was identified that the conditions in the pedestrian pathway on the Pemuda street had changed its function as a place to trade, an online motorcycle taxi base, as well as a parking lot for visitors to shops / dining places along the Pemuda street which caused the main function of the pedestrian path for pedestrians. feet are not a priority anymore. Therefore, the aim of this study is to see whether gender differences affect pedestrians' perceptions of the comfort level of the pedestrian paths located on Pemuda street Rawamangun. The results of this study can assist planners, policy makers and facility providers in providing and improving optimal pedestrian
facilities that take into account local pedestrian travel preferences and characteristics rather than using existing rules of thumb.

2. Methodology
The method used in this research is quantitative descriptive method [17]. The quantitative descriptive method that is intended is to determine the perception of pedestrians on the level of comfort of the pedestrian lane on Pemuda street and will be represented as a number of certain indicators so that it is known how much the impact of comfort felt by road users in transportation [17]. Pemuda street is one of the protocol roads in the Rawamangun area in the city of Jakarta. With these considerations, Pemuda street Rawamangun is considered significant and representative to be the choice of location in conducting this research.

Data collection was carried out through surveys with observations and questionnaires [18]. A questionnaire is a data collection technique that is carried out by giving a set of questions or written statements to respondents to answer [17]. Google form-based questionnaires will be given to respondents related to this research, namely, pedestrian users who have done activities on Pemuda street Jakarta City pedestrian path. While the sampling technique that will be taken in this research is the method of taking random samples (random sampling). The advantage of this sampling technique is

![Flow chart diagram](image)
that it is easy, and fast, just like accidental sampling [19]. Then the respondents consisted of at least 100 people who were pedestrians who had passed along Pemuda street Jakarta. The data obtained will describe the perceptions of the comfort level of pedestrian lane users, especially pedestrians on Pemuda street Jakarta. In order to easily analyze the data obtained from respondents, you can take the following steps [20]:

a. Calculate the respondent’s score
b. Set the questionnaire score with agreed terms.
c. Determine the maximum score obtained from the multiplication of the lowest score, the number of items, and the number of respondents. The lowest score is 1 (one) so: the minimum score = 1 x 5 xn = 5n.

**Table 1. The comfort level criteria score interval ranking**

| Score Interval | Percentage Interval       | Comfort Level Criteria          |
|----------------|---------------------------|---------------------------------|
| 22n ≤ X ≤ 25n  | 84% ≤ X ≤ 100%            | Very Comfortable                |
| 18n ≤ X ≤ 21n  | 68% ≤ X ≤ 84%             | Comfortable                     |
| 14n ≤ X ≤ 17n  | 52% ≤ X ≤ 68%             | Quite Comfortable               |
| 10n ≤ X ≤ 13n  | 36% ≤ X ≤ 52%             | Uncomfortable                   |
| 5n ≤ X ≤ 9n    | 20% ≤ X ≤ 36%             | Very Uncomfortable              |

d. The calculation of the respondent's score and the percentage of pedestrian comfort level is as follows:

1) Add up the scores obtained from each respondent.
2) Calculate the percentage of the comfort level by dividing the total acquisition score of the respondent by the maximum total score multiplied by 100%.

e. Establishment of pedestrian comfort level criteria based on the specified criteria standards. The instruments used in this study are an adaptation of the comfort factor proposed with development and adjustment by researchers [20][21][22]. In implementation in the field, it is necessary to understand that all instruments should be made as well as possible and comprehensive [23].
Table 2. Comfort level aspects and indicators

| No | Aspects                        | Indicator                                                                                                                                                                                                 |
|----|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Accessibility and Circulation  | a. Pedestrian paths can be accessed/traversed by all pedestrians, including those with special needs.                                                                                                    |
|    |                                | b. Pedestrian paths continuously from one point to another (connected to each other).                                                                                                                    |
|    |                                | c. The lane width is sufficient so that pedestrians are free to move                                                                                                                                       |
|    |                                | d. There are adequate crossing routes                                                                                                                                                                      |
|    |                                | e. Public transportation is available to change the mode of transportation.                                                                                                                                  |
|    |                                | f. There is a shelter from the hot sun during the day.                                                                                                                                                     |
|    |                                | g. Available vegetation / trees along the pedestrian path.                                                                                                                                                  |
|    |                                | h. Clarity of circulation between pedestrians & other activities (street vendors, parking, roller skating, cycling, etc.).                                                                                |
| 2  | Pedestrian Conditions          | a. The pedestrian path is in decent condition and has no holes.                                                                                                                                            |
|    |                                | b. The surface of the pedestrian path is flat, does not go up and down.                                                                                                                                   |
|    |                                | c. The surface of the pedestrian path is not slippery.                                                                                                                                                     |
|    |                                | d. There is a difference in the surface height of the pedestrian path and the traffic lane.                                                                                                                |
|    |                                | e. The slope of the pedestrian path is quite gentle.                                                                                                                                                       |
| 3  | Hygiene                        | a. The pedestrian path is clean from trash.                                                                                                                                                                |
|    |                                | b. The surface of the pedestrian path is maintained and not overgrown with shrubs.                                                                                                                         |
|    |                                | c. There is access to clean drainage channels.                                                                                                                                                            |
|    |                                | d. The cover material has high absorption.                                                                                                                                                                |
|    |                                | e. Odorless environment.                                                                                                                                                                                 |
| 4  | Beauty of Space                | a. Attractive pedestrian path design.                                                                                                                                                                      |
|    |                                | b. Patterned / patterned pedestrian path covering material.                                                                                                                                                 |
|    |                                | c. Attractive colored cover material.                                                                                                                                                                      |
|    |                                | d. Decorative shade trees and curbside plants.                                                                                                                                                              |
|    |                                | e. Attractive lighting design.                                                                                                                                                                             |
| 5  | Pedestrians Obstacles          | a. Merchant furniture that is above the pedestrian path or street vendors blocking the pedestrian path.                                                                                                     |
|    |                                | b. There are two-wheeled vehicles passing on the pedestrian path.                                                                                                                                          |
|    |                                | c. Flower pots / trash cans above the pedestrian path block pedestrians.                                                                                                                                   |
|    |                                | d. Parking of vehicles blocking pedestrian paths.                                                                                                                                                            |
|    |                                | e. Protrusions of buildings, electric poles / billboards blocking pedestrian paths.                                                                                                                        |
3. Result and Discussion

After the research data is obtained, the data is processed to determine how much the percentage of the comfort level of the pedestrian lane users based on the aspects and indicators as well as the predetermined interval ranking. After the research survey, there were 156 respondents consisting of 96 female respondents and 60 male respondents with the following data.

3.1 General Condition

Pemuda street is one of the protocol roads that connects Ahmad Yani Street and Raya Bekasi Street, therefore the existence of the pedestrian lane on Pemuda street is one of the access roads connecting the road around the road. Not only that, Pemuda street is one of the roads that is used as a shopping center, food center, sports center, and a new mode of transportation that has become the icon of today's Pemuda street, namely the LRT. With these conditions, this area is always densely visited and the majority of people passing through this road are female.

Figure 2. Map and condition of Pemuda Rawamangun Street

Figure 3. Cross-sectional view of Pemuda Rawamangun Street
3.2 Analysis of Pedestrian Comfort Level on Pedestrian Paths on Pemuda street Rawamangun.
Pedestrians' perceptions of the comfort level of the pedestrian path include several factors, namely: the level of accessibility and circulation, the level of surface conditions, the level of cleanliness, the level of beauty, and the level of obstacles / obstacles to the pedestrian path. For the overall percentage of respondents on the comfort level of the pedestrian path, it is obtained as follows:

Total respondents = 156 people
Percentage of pedestrian comfort level

\[
\text{Percentage of pedestrian comfort level} = \frac{\text{Total respondent score}}{\text{Total respondent score}} \times 100\% \tag{1}
\]

Total respondent score = 14878
Maximum score = \( \text{highest score} \times \text{number of questions} \times \text{number of respondents} \) \tag{2}

\[
= 5 \times 28 \times 156
= 21840
\]

Percentage of pedestrian comfort level

\[
= \frac{14878}{21840} \times 100\%
= 68,12\%
\]

By referring to table 1 above, it can be seen that overall respondents agree that the pedestrian path on Pemuda street is comfortable. And can be seen in the following table

Table 3. The ranking of the overall safety criteria score intervals

| Score Interval | Percentage Interval | Comfort Level Criteria |
|----------------|---------------------|------------------------|
| 22n ≤ X ≤ 25n  | 84% ≤ X ≤ 100%      | Very Comfortable       |
| 18n ≤ X ≤ 21n  | 68% ≤ X ≤ 84%       | Comfortable            |
| 14n ≤ X ≤ 17n  | 52% ≤ X ≤ 68%       | Comfortable Enough     |
| 10n ≤ X ≤ 13n  | 36% ≤ X ≤ 52%       | Uncomfortable          |
| 5n ≤ X ≤ 9n    | 20% ≤ X ≤ 36%       | Very Uncomfortable     |

3.3 Pedestrian Path Comfort Level Analysis Based on Gender per Indicator

Table 4. Pedestrian path comfort level analysis based on gender per indicator

| Indicator                  | Men (%) | Women (%) |
|----------------------------|---------|-----------|
| Accessibility and Circulation | 72,29   | 70,08     |
| Pedestrian Conditions       | 78,93   | 75,08     |
| Hygiene                     | 73,60   | 69,67     |
| Beauty of Space             | 69,73   | 69,554    |
| Pedestrians Obstacles       | 52,33   | 49,58     |

Based on the data obtained from each indicator, it can be concluded that the highest percentage is found in the indicator of the surface condition of the male gender, namely 78.93%, while the female is 75.08% and the lowest percentage is found in the pedestrian path indicator. 52.33% male, while 49.58% female. This means that both men and women agree that the surface conditions of the Youth pedestrian pathway are comfortable, but for obstacle indicators both men and women feel uncomfortable. This needs to be reviewed again related to the causes of obstacles that make pedestrians very uncomfortable so that it can be an input for the local government of the capital city of Jakarta.
The results obtained in this study gender influencing the comfort level of a pedestrian on the pedestrian path. This is reinforced by the results of research conducted by Park & Garcia, suggesting that age and gender affect the level of anxiety among pedestrians. The results obtained in this study, gender or female gender, have a fairly safe level of comfort when walking than men. This can be seen from the percentage found that the percentage of women has a high enough score than men [15]. However, this is contrary to the results of research conducted by Arshad et al., which was conducted in Kuala Lumpur and found that female pedestrians give lower satisfaction scores for the overall travel experience on Tuanku Abdul Rahman Street but the satisfaction scores were more high on Petaling Street and Bukit Bintang compared to male pedestrians [24]. Meanwhile, based on research conducted by Hidayat, Choocharukul, & Kishi, states that groups of women consider their comfort more than other factors for their walking trip. The most important determinant (the largest total effect) of sidewalk performance in the male group is the perception of pedestrian interaction, while the most important determinant of sidewalk performance in the female group is the perception of the condition of the sidewalk [25]. Research conducted by Wang, Schwebel, Tan, Shi, & Miao states that men and women show different characteristics in pedestrian behavior [26]. The difference in the results of the research obtained with the results of research that has been conducted by previous researchers is due to the different research locations that affect the results obtained. This can also be influenced by several factors, for example the condition of the sidewalks / pedestrian paths under review, the interactions carried out by pedestrians, and having different characteristics between men and women in using the pedestrian path.

4. Conclusions
Based on the results of data analysis carried out in research studies on pedestrian perceptions of the level of comfort of the pedestrian paths on Pemuda street Rawamangun, the results is from 156 respondents who stated that overall the level of comfort was felt to be comfortable with a percentage of 68.12%. This is supported by several indicator factors, namely: the level of accessibility and circulation, the level of surface conditions, the level of cleanliness, the level of beauty, and the level of obstacles / obstacles to pedestrian paths. From some of these indicators, it shows that the percentage of surface condition indicators, both male gender is 78.93%, and female, 75.08%, agrees that the surface condition of the Pedestrian lane on the Pemuda street is comfortable, but the percentage on the indicator of obstacles to the pedestrian path both men 52.33% and women 49.58% felt uncomfortable. So, recommendation from this paper are the results show that the comfort level of the pedestrian lane on Pemuda street Rawamangun is in the comfort criteria. This must be maintained or even there must be several things in terms of aspects that need to be improved, especially the level of comfort, especially restoring the function of the sidewalk so that people feel more comfortable. This repair must pay attention to various aspects of public interest, merchant activity, parking, and vehicle circulation. Other than that, repairing sidewalk facilities must pay attention to several important elements in supporting the interests of the community, among others, 1) distribution of pedestrian circulation with traders on the sidewalk, 2) distribution of vehicle parking, 3) flower pots and trash cans are placed in the right place so that do not obstruct pedestrians.

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