

Walking behavior on Lapangan Merdeka district in Medan city

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Abstract. Lapangan Merdeka district in Medan City is an area with a lot of functions and activities. Pedestrians in this area pose particular behavior for walking. Such behavior can be formed due to certain factors. This study aimed to identify the behavior and motivation of walking, as well as knowing the perception of pedestrians on pedestrian facilities and infrastructures. This research is a qualitative descriptive study. This research was conducted in five streets that have pedestrian lanes by collecting data through observation of pedestrian facilities and infrastructures, as well as the distribution of questionnaires to investigate the characteristics of pedestrians, the behavior and motivation of walking, and perceptions of pedestrian facilities and infrastructure. The research found that the behavior of pedestrians when walking are different on certain characteristics of pedestrians as well as the specific conditions of facilities and infrastructures. The most dominant motivation when walking in this area is easy transportation access. The results of the perception of pedestrians also show that pedestrian facilities and infrastructure are good in this area.

1. Introduction

Lapangan Merdeka district as a center of Medan City generates activities inside it. One of the activities is walking. Walking is the primary means of internal movement within cities [1]. Pedestrian on Lapangan Merdeka district forms certain behaviours. These behaviours indicate pedestrian interaction with the surrounding environment in which they operate. The interaction between activities with a specific place to find patterns of behaviour associated with existing physical elements [2]. Based on these conditions, this study intends to trace the walking behaviour associated with physical elements that exist in the Lapangan Merdeka district in the Medan City.

1.1. Walking Behaviour

Behaviour shows humans in action, related to the physical activity of humans, in the form of human interaction with each other or with their physical environment [3]. Walking behaviour relates to how people walk by looking at the relationship between the time taken to move from one place to another place, to determine the direction of walking, to avoid clashes with others and other behaviours that can arise during the period of walking [4].



Pedestrians have characteristics based on their walking behaviour. The way to see these characteristics is to record and measure walking behaviour. This can be done by listing and measuring the following elements [4][5] which are walking distance, walking duration, walking speed, walking direction and pattern, and formation.

1.2. Pedestrian Facilities

Pedestrian facilities are drainage, green lines, lighting, seating, safety fences, bins, markers and signs, information boards, bus stops, waiting stalls, bollard and public phones [6][7].

1.3. Walking Motivation

According to LGC [8], motivating factors for walking are as follows:

- Through street.
Street or paths which connect to multiple destinations encourage walking.
- Compact development area.
Compact development makes walking possible because destinations are closer to one another and the walk is more interesting.
- Windows on the street.
Windows and people along the street create a safe and pleasant place to walk.
- Crosswalk facilities.
Well-marked crosswalks help the pedestrian feel safer when crossing a wide street.
- Short block or mid-block alleys and paths
Mid-block crossings make walking more convenient.
- Interesting or beautiful walks
Amenities such as landscaping encourage pedestrian use on the facilities.
- Narrow, shaded by tree streets.
Narrow, shaded streets can slow down the cars's speed and be up to 10 degrees cooler, making walking far more pleasant for pedestrian.
- Street with medians.
Adding a street median will make it more pleasant and safe to cross the street.
- Neighborhood schools.
When schools are integrated into the neighborhood, children can walk or ride a bike.
- Neighborhood parks.
Neighborhood parks allow kids to be more active when they are in their own neighborhood.
- Neighborhood grocery stores.
A neighborhood store allows family members to pick up daily needs by walking.
- Office in downtown or neighborhood.
This kind of office location allows people to walk to work and go to lunch without climbing in a car.

2. Methods

This paper can be categorized as a descriptive research. This research uses qualitative. This study aims to determine the behaviour of pedestrians. Research started by conducting survey on existing pedestrian way in Lapangan Merdeka district. From the survey conducted, obtained 5 roads studied in this study. They are Raden Saleh Street, Balai Kota Street, Station Street, Bukit Barisan Street, and Pulau Pinang Street.

The data in this study were obtained from two sources of data: qualitative data and quantitative data. The qualitative data are pedestrian path data in Lapangan Merdeka district in Medan City, while quantitative data are pedestrian characteristic data, pedestrian behavior data, pedestrian motivation, and

pedestrian perception towards pedestrian facilities. Then, the data is analysed by cross tabulation method with descriptive analysis.

3. Result and Discussion

3.1. Walking Behaviour

On this research, respondents which interviewed are male 58% and female 42%. Most of them are teenagers, they are <17 years respondents 17%, 17-26 years 48%, 27-36 years 18%, 37-46 years 12%, dan >46 years 5%. More than half of research respondents use private transportation 57% which is more than public transportation users 43%.

3.1.1. Walking Distance

In Lapangan Merdeka district, most of respondents walk on 300-450 meter range. With an average walking distance of 441 meters (see Table 1)

Table 1. Walking Distance

| Walking Distance | Respondent |
|------------------|----------------|
| 100-250 m | 14 respondents |
| 300-450 m | 44 respondents |
| 500-650 m | 27 respondents |
| 700-850 m | 15 respondents |

Walking distance based on gender, female (450 m) walk farther than male (434.5). Based on age, people aged 17-26 years walk farther (484.4 m) than people <17 years (438.2 m), 27-36 years (472.2 m), 37-46 years (266.7 m), and >46 years (340 m). Then, the public transportation users take average 479.1 meter on walking, this is farther when compared with private transportation users (412.3 m).

3.1.2. Walking Duration

Walking duration is related to the distance traveled by the respondent. The further a walk, the duration of walking will be longer.

Table 2. Walking duration

| Walking Duration | Respondent | Walking distance average |
|------------------|----------------|--------------------------|
| <5 minutes | 22 respondents | 238.6 meter |
| 5-10 minutes | 49 respondents | 407.1 meter |
| 11-15 minutes | 14 respondents | 589.3 meter |
| 16-20 minutes | 14 respondents | 700 meter |
| >20 minutes | 1 respondent | 850 meter |

Based on Barton, Grant and Guise [9], the average pedestrian travel distance of 400 meters approximately 5 minutes, whereas in Merdeka Square area in Medan city, 22 respondents on average walk 238.6 meters with travel time 5 minutes down. 49 respondents in this region walk with a span of 5 to 10 minutes to travel as far as 407.1 meters. 14 respondents walk with a span of 5 minutes to take the route as far as 589.3 meters. Then to reach the route as far as 700 meters, 14 respondents walk with a span of 16 to 20 minutes. Finally, there is only 1 respondent who walk with travel time above 20 minutes as far as 850 meter.

Table 3. Walking duration based on gender

| No | Duration | Male | Average (meter) | Female | Average (meter) |
|-------------------|---------------|------|-----------------|--------|-----------------|
| 1 | <5 Minutes | 14 | 210.7 | 8 | 287.5 |
| 2 | 5-10 Minutes | 26 | 409.6 | 23 | 404.4 |
| 3 | 11-15 Minutes | 8 | 581.2 | 6 | 600 |
| 4 | 16-20 Minutes | 9 | 677.8 | 5 | 740 |
| 5 | >20 Minutes | 1 | 850 | - | - |
| Respondents total | | 58 | | 42 | |

Table 3 shows how the sex of the respondent relates to the duration of walking. In Table 3 it was found that the majority of pedestrians walked within 5 to 10 minutes. Male respondents, from 58 respondents, 44.8% (26 respondents) walked on this time span. While female respondents, from 42 respondents, 54.8% (23 respondents) walked on this time span. This suggests that female respondents are walking more in this time span. The average distance travelled by female respondents in this time span is shorter than the male respondent, which is 404.4 meters versus 409.6 meters.

In addition, for other time spans, 24.1% of male respondents walk within a span of less than 5 minutes. Whereas in female respondents, 19% of female respondents walk on this timeframe. This suggests that more male respondents walk on this time span. The average distance travelled by female respondents over this time span is longer than that of male respondents, which is 287.5 meter versus 210,7 meter.

13.8% of male respondents walked within 11 to 15 minutes. Whereas in female respondents, there are 14.3% of female respondents walk on this timeframe. This suggests that more women walk on this time span. The average distance travelled by female respondents over this timeframe is longer than the male respondent, which is 600 meters versus 581.2 meters.

15.5% of male respondents walk within 16 to 20 minutes. Whereas in female respondents, there are 11.9% of female respondents walk on this timeframe. This suggests that more male respondents walk on this time span. However, the average distance travelled by female respondents over this timeframe is longer than the male respondent, which is 740 meters versus 677.8 meters. The rest, for respondents who walk over 20 minutes is only done by 1 male respondents (1.7%) with a distance of 850 meters.

The average distance of female respondents farther than male respondents in the span of time over 11 minutes. This indicates the further the journey that will be taken by female respondents, then the speed of the walk of female respondents will increase. As for the close distance makes women respondents walk more relaxed. It can also be seen in male respondents, where the speed of walking of male respondents is lower than female respondents.

Table 4. Walking duration based on age

| No | Duration | <17 years | Average (meter) | 17-26 years | Average (meter) | 27-36 years | Average (meter) | 37-46 years | Average (meter) | >46 years | Average (meter) |
|----|--------------|-----------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-----------|-----------------|
| 1 | <5 Minutes | 2 | 250 | 9 | 311.1 | 2 | 275 | 6 | 175 | 3 | 116.7 |
| 2 | 5-10 Minutes | 12 | 425 | 23 | 415.2 | 10 | 395 | 4 | 337 | - | - |

| | | | | | | | | | | | |
|-------------------|---------------|---|-------|---|-------|---|-----|---|-----|---|-----|
| 3 | 11-15 Minutes | 3 | 616.7 | 8 | 612.5 | 1 | 700 | 2 | 400 | - | - |
| 4 | 16-20 Minutes | - | - | 8 | 750 | 5 | 660 | - | - | 1 | 500 |
| 5 | >20 Minutes | - | - | - | - | - | - | - | - | 1 | 850 |
| Respondents total | | | 17 | | 48 | | 18 | | 12 | | 5 |

Table 4 shows how the respondent's age relation to walking duration. In Table 4. it is found that there are some findings related to the duration of walking the most widely travelled by the respondents. In the age group 17 years and under, 17-26 years, and 27-36 years of age, the majority walks within 5 to 10 minutes. While the age group 37-46 years and 46 years old and above most walking on a span of time under 5 minutes.

In Table 4. Can be seen how the age factor affects walking distance based on the duration of the trip. In the time span of 5 minutes down, the average highest mileage was achieved by the age group 17-26 years, is 311.1 meters. After that age group, there is a tendency that the average mileage is decreasing. Where the age group of 46 years and over travelled the lowest average distance, which is 116.7 meters in this time span.

From the analysis, it can be concluded that in relatively young age groups (17 years and under, 17-26 years, and 27-36 years old) have the ability to travel longer distances for each time span. This shows that the influence of age to travel time and ability to take the destination on Lapangan Merdeka district in Medan city.

Table 5. Walking duration based on transportation use

| No | Duration | Private Transportation | Average (meter) | Public Transportation | Average (meter) |
|-------------------|---------------|------------------------|-----------------|-----------------------|-----------------|
| 1 | <5 Minutes | 10 | 185 | 12 | 283.3 |
| 2 | 5-10 Minutes | 33 | 400 | 16 | 421.9 |
| 3 | 11-15 Minutes | 7 | 557.1 | 7 | 621.4 |
| 4 | 16-20 Minutes | 7 | 650 | 7 | 750 |
| 5 | >20 Minutes | - | - | 1 | 850 |
| Respondents total | | | 57 | | 43 |

Table 5 shows the relationship of the mode of transportation selection to the duration of walking. In Table 5 it was found that there were findings related to the duration of walking the most widely travelled by the respondents. The majority of respondents who choose non-public transportation or public transportation walk within 5-10 minutes.

In the time span of 5 minutes down, the average highest mileage was reached by respondents using public transportation, which is 283.3 meters. Later, respondents using non-public transport that walked on this time span travelled the lowest average distance of 185 meters.

In the span of 5-10 minutes, the highest average mileage was achieved by respondents using public transportation, which is 421.9 meters. Later, respondents using non-public transport walked on this time span, traveling the lowest average distance of 400 meters.

At 11-15 minutes, the highest average distance reached by respondents using public transportation, which is 621.4 meters. Then, non-public transport user respondents walk on this time span the lowest average distance of 557.1 meters.

In the 16-20 minute timeframe, the highest average mileage was achieved by respondents using public transport, 750 meters. Then, non-public transport user respondents walk on this time span the lowest average distance, which is 650 meters.

Finally, for the time span of over 20 minutes is only passed by 1 respondent who uses public transportation. The distance travelled in this time span is 850 meters.

From the results of the discussion above, it can be concluded that the findings where for each time span, public transport users respondents will walk further. This shows that vehicle ownership affects distance, duration, and walking speed. The tendency that non-public vehicle user respondents make the respondents walk more slowly than public transportation user respondents.

3.2. Walking Motivation

In general, from the questionnaire distribution, respondents may choose more than one option on walking motivation in this area. So it can be seen how the influence and relationship motivation and walking behavior in this area. The results of the analysis are expected to produce findings that will show the quality of this area in giving space to pedestrians.



Figure 1. Walking motivation by correspondents

Of the 100 respondents, there were only 6 respondents who were motivated to walk due to the factor of this area connecting the place easily. This shows there are still many respondents who are not motivated by this factor. Then, the presence factor of the crowd only motivates 3 respondents to walk in this area.

Furthermore, 46 respondents stated that the accessibility aspect of public transportation access is motivational for walking in this area. The ease of reaching public transportation such as *angkot*, *becak*, taxi, and buses make respondents tend to be motivated to walk in this area. This can be a consideration in public transport planning. Increasing the quality and quantity of facilities for public transportation is a major concern that can invite the public to take more advantage of public transport. More and more people are using public transportation, it will increase the walking activity in this area.

Then, 43 respondents considered that safe areas of crime and traffic were the contributing factors that respondents wanted to walk in this area. Security is an important factor that can make a person motivated to walk in an area. Lapangan Merdeka district is considered to have good security from crime and traffic.

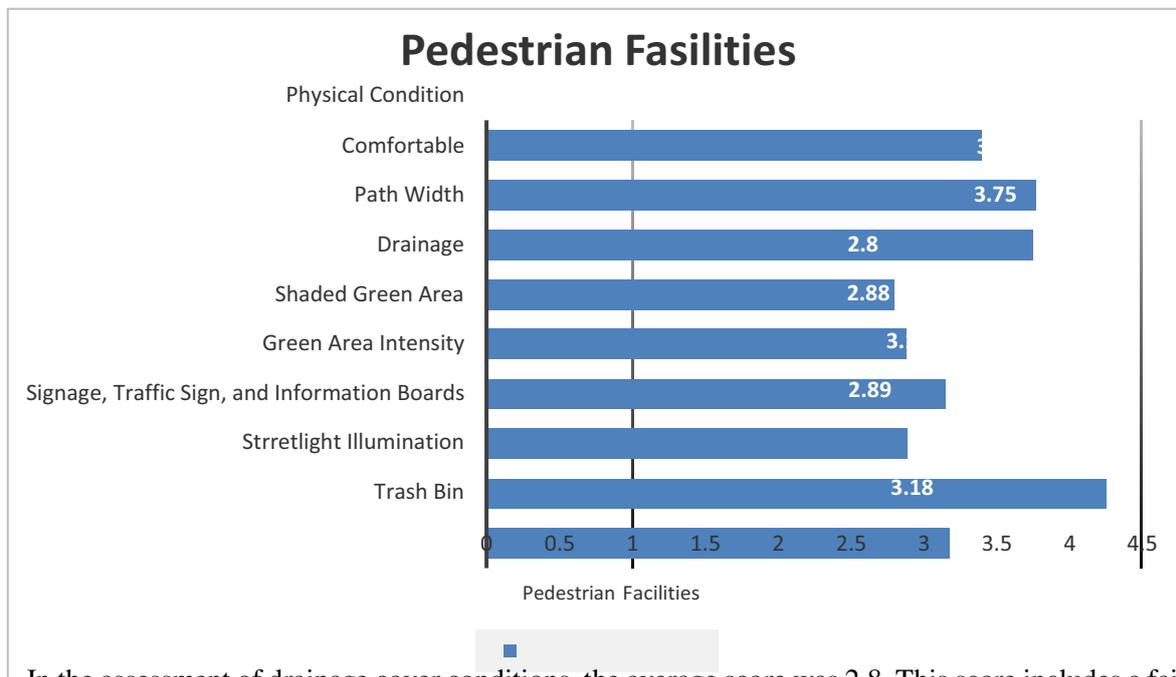
The next motivation is the attraction of the Lapangan Merdeka district. The attractiveness of this area is a factor that can lead to a desire to walk. This can be seen from 37 respondents assess the area has an attraction that is able to invite people to walk. The attraction in this area is Lapangan Merdeka which is an area that has a historical value in the development of the Medan City. The existence of Lapangan Merdeka and historic buildings are strategic points as the attraction of this region.

In the Lapangan Merdeka district, there are 6 respondents who are motivated to walk because this area has a wide and comfortable pedestrian path. 1 respondent felt the presence of shady trees has motivated respondents to walk. Finally, only 1 respondent walks to improve health quality in the region.

3.3. *Perception of respondents to pedestrian facilities*

From perception data processing of respondents to pedestrian facilities at Lapangan Merdeka district in Medan City, yielded average rating to each indicator. As seen in figure 2, on an assessment of the physical condition of the pedestrian pathway, the average score is 3.4. This score is included in the overall good scoring range. On the assessment of the comfort conditions of the pedestrian path, average score is 3.77. This score is included in the overall good scoring range. In the assessment of pedestrian wide path conditions, the average score is 3.75. This score is included in the overall good scoring range.

Figure 2. *Perception of respondents to pedestrian facilities*



In the assessment of drainage cover conditions, the average score was 2.8. This score includes a fairly good overall rating range. In the assessment of green area shade, the average score generated was 2.88. This score includes a fairly good overall rating range. On an assessment of the intensity of the green area, the average score is 3.15. This score includes a fairly good overall rating range.

On the assessment of road markers, traffic signs, and information boards, the average score is 2.89. This score includes a fairly good overall rating range. In the streetlight illumination rating, the average

score generated is 4.26. This score includes an excellent overall rating range. On hygiene assessment, the average score is 3.18. This score includes a fairly good overall rating range.

From this result, overall, the average assessment of respondents to this pedestrian path facility is 3.34. Overall, the pedestrian path facility in Lapangan Merdeka district is considered quite good by the respondents.

4. Conclusions

The average distance of the respondents in this area is 441 meters. Walking distance travelled by pedestrians in this area is around 100 to 450 meters. This suggests that pedestrians tend to walk on short distances. The female respondents travelled farther than the male respondents in the region, with a ratio of 450 meters to 434.5 meters. The farthest distance averages that can be taken by respondents by age are the age range of 17 to 26 years of walking distance of 484.4 meters.

In addition, the walking distance tends to be shorter if the frequency goes on foot more often. Conversely, pedestrians walk further if they do not walk very often in this area. Based on the transportation use, respondents using public transportation tend to travel further. This can be seen also as a tendency to reach the points of existence of public transport, pedestrians have to walk longer.

In general, respondents in the Lapangan Merdeka district walk a lot on shorter routes. 71% of respondents walk on a route that takes a maximum of 10 minutes. The same trend is also found in analysis of walking duration by sex, age, and selection of modes of transportation.

The ease of reaching public transportation such as *angkot*, *becak*, taxi, and buses make respondents tend to be motivated to walk in this area. This can be a consideration in public transport planning. Increasing the quality and quantity of facilities for public transportation is a major concern that can invite the public to take more advantage of public transport. More and more people are using public transportation, it will increase the walking activity in this area. The average assessment of respondents to this pedestrian path facility is 3.34. Overall, the pedestrian path facility in Lapangan Merdeka district is considered quite good by the respondents..

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