

Walking and Bicycling Suitability Assessment at IIUM Pagoh Campus

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Abstract

Active transport is a combination of walking and cycling integrated with public transport. Walking and Bicycling Suitability Assessment is used for walkability and cyclability assessment for the study site. This study focuses on students of the International Islamic University of Malaysia in the Pagoh Higher Education Hub. The objectives of this study were to identify active transport practices regarding distance, conduct a walking suitability assessment using the Walkability and Bicycling Suitable Assessment procedure, and propose improvement along the walking route based on the available best practices. Therefore, a questionnaire survey was distributed to 130 respondents to achieve the first objective. Meanwhile, the assessment of walking and bicycling suitability was carried out by on-foot investigations. The Countcam3+ device was used to collect traffic volume, especially along the main road of Jalan Panchor. The on-foot investigation was conducted along the typical students' walking route, which was divided into 3 sections starting from the Residential College to the campus. Outcomes from the survey showed that 39.7 percent of students were willing to walk less than 1 kilometer, and the tendency to walk was decreasing with increased distances. For the walking suitability assessment, among the three sections that were assessed, it was found that one section showed the worst score while another was poor and good. However, for the bicycling suitability assessment, all sections were in very poor condition due to no proper bicycling lane, especially on paved roads. Therefore, the improvement of the worst section is an urgent need for the responsible authority so that students can pass through that segment of the road safely either walking or bicycling. In conclusion, a continuous walking and bicycling suitability assessment should be taken into consideration to encourage an active transport culture among young people, particularly higher education students.

1. Introduction

Walking and bicycling or biking suitability assessment describes the process of determining if a location or route is appropriate for biking and walking. To assess how effectively an area or route supports and encourages walking and biking as modes of transportation, a variety of characteristics, including infrastructure, safety, connection,

and accessibility, are often examined. From a single neighborhood to an entire city or region, the evaluation can be done in a variety of sizes. It assists in identifying both places that are convenient for walkers and cyclists and those that can benefit from changes [1] - [4]. Active transportation improves communities by lowering pollution, noise, and traffic. Also, it makes them more enjoyable and healthier [5]. Active transportation improves communities by lowering pollution, noise, and traffic. However, only 5% of Americans claimed to commute to work on foot, and by bicycle [6]. The level of satisfaction with the facilities and the interest of pedestrians has a favorable impact on the value of walkability [7].

The International Islamic University of Malaysia (IIUM) is one of the universities located in the Higher Education Hub in Pagoh, Johor. The small campus is located next to the UTHM Pagoh Campus with nearly 1000 students. There are two modes for these students to go to their campus from their residential college which are by walking/bicycling or by using a provided bus. Through random observation, walking is fairly being a popular mode of travel by IIUM students. However, can the existing route be considered safe and conducive for walking? To answer this question, an assessment was carried out to determine not only the suitability of walking but also the practical suggestion to improve walking facilities. The University of North Carolina at Chapel Hill has established an assessment method called the Walking and Bicycling Suitability Assessment or WABSA to assess and improve facilities and promote active transport for the purpose of improving public health among communities [8]. Therefore, in this study, WABSA was used to identify the suitability level of the existing walking route.

The aim of this research was to determine walking suitability at the IIUM Pagoh campus using WABSA. Therefore, this study was carried out to conduct a survey on active transportation practice by the students of IIUM Pagoh Campus, to assess the walking suitability at IIUM Pagoh campus using WABSA, and to recommend improvement in encouraging active transportation practice. In this study, the data collection was carried out using a questionnaire survey that was given to respondents among students from the Kulliyah of Languages and Management, IIUM Pagoh Campus. Questions to be asked can be referred to in Material and Methods. The on-foot observation was carried out for the assessment. This assessment also involves traffic counting to obtain the average annual daily traffic (AADT) along Jalan Panchor from the IIUM residential college to the campus.

2. Materials and Methods

2.1 Materials

Other than questionnaire forms and common measuring devices, CountCam3+ was used to measure AADT along Jalan Panchor. The CountCAM3+ is a video-based traffic recorder used to collect AADT data along Jalan Panchor. It is capable of continuously recording up to 85 hours of video in camera mode and 65 hours of directional traffic volume in counter mode [9]. In this study, counter mode was used in data collection. It was installed at the side of the main road by attaching it to the available lamp post. The raw data produced by this device is traffic volume at 15-minute intervals.

2.2 Methods

Information gathered from the questionnaire and investigation were the outcomes of this study. Therefore, a proper framework was planned to achieve all the objectives which are previously mentioned. Figure 1 shows the flowchart of the overall methodology of this study. Referring to Fig. 1, this study started with searching for literature from previous studies that were published in journals. Then, it led to the discussion on the selection of study location and the approaches to gather information and data.

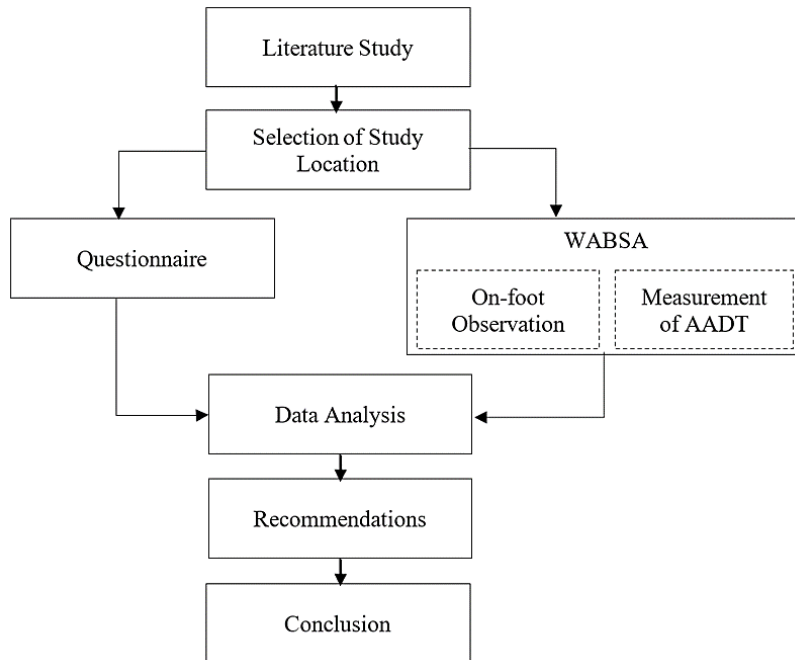


Fig. 1 Flowchart of the overall methodology

2.2.1 Questionnaire Survey

The questionnaire consists of Part A (Demographic) and Part B (Travel mode selection) distributed among 130 IIUM Students. The number of PTSN students that have stayed in the UTHM Residential College is approximately 200 students. The questionnaire is an identical questionnaire used by Yuen Choo Wah (2022), a researcher from Universiti Malaya with slight modifications of demographic questions to suit the targeted respondents [10]. Table 1 shows questions in the survey.

Table 1 Questions in the questionnaire

Part	Question: Answer option
A: Demographic	i. Gender: Male/Female ii. Age: 18-20/21-23/24-39/40 and above iii. Ethnicity: Malay/Chinese/Indian/Others iv. Private motorcycle/car ownership: v. Yes/No University's Bus User: Yes/No
B: Travel mode selection	i. Distance to Neighbourhood Facilities: Less than 1km/1 – 1.9 km/2 – 2.9km/3 – 3.9 km/More than 4 km ii. Distance to Campus: Less than 1km/1 – 1.9 km/2 – 2.9km/3 – 3.9 km/More than 4 km iii. Travel mode selection for a distance of less than 1km: Walk/Bicycle/Bus/Motorcycle/Car iv. Travel mode selection for a distance of 1 – 1.9 km: Walk/Bicycle/Bus/Motorcycle/Car v. Travel mode selection for a distance of 2 – 2.9km: Walk/Bicycle/Bus/Motorcycle/Car vi. Travel mode selection for a distance of 3 – 3.9 km: Walk/Bicycle/Bus/Motorcycle/Car vii. Travel mode selection for distances of more than 4 km: Walk/Bicycle/Bus/Motorcycle/Car viii. Frequency of Walking (times per week): 1-2/3-4/5-6/7-8/9-10/>10 ix. Frequency of Bicycling (times per week): 1-2/3-4/5-6/7-8/9-10/>10 x. Preferable duration of Walking (minutes): 5/10/15/20/25/30/>30

2.2.2 Walking and Bicycling Suitability Assessment

The assessment was carried out by an on-foot investigation. Characteristics that were assessed in the walking suitability assessment are AADT, posted speed limit, number of through lanes for both directions, presence of a sidewalk, sidewalk material, sidewalk surface condition, sidewalk width, buffer width, curb ramps, street lighting, isolated problem spots, and intersections [8]. While characteristics assessed in bicycling suitability assessment are AADT, number of through lanes, posted speed limit, outside lane width, bike lane width, pavement factors, and location factors. Each characteristic has its score for a certain value or quality, for example for sidewalk surface condition, the scores for good, fair, and poor are 0, 1, and 4, respectively. A total score was used to determine the walking suitability level of assessed road segments. Tables 2 and 3 show the walking and bicycling suitability level and colour representative based on scores, respectively [8].

Table 2 Walking suitability level with scores












Scores	Walking suitability level	Colour
< 3.0	Very Good	
3.0 – 5.9	Good	
6.0 – 8.9	Fair	
9.0 – 26.0	Poor	
99.0	(No sidewalk on quiet street)	
> 99.0	(No sidewalk on a busy street)	

Table 3 Bicycling suitability level with scores

Scores	Bicycling suitability level	Colour
< 3.00	Very Good	
3.00 – 3.99	Good	
4.00 – 4.99	Fair	
5.00 – 6.99	Poor	
> 6.99	Very Poor	

2.2.3 AADT Measurement

One of the characteristics to be assessed in WABSA is AADT. It can be characterized as the daily average number of vehicles using the road segment. As previously mentioned, the CountCam3+ device was used to record commuter traffic volumes along Jalan Panchor. Data from the device were downloaded in Excel format. However, the AADT of other road segments was determined using a formula proposed by WABSA [8], as shown in Equation (1).

$$\text{AADT} = (\text{number of vehicles in 15 minutes}) \times (4) \times (12.5) \quad (1)$$

Many vehicles passing by were counted during the commute hours (generally somewhere between 7:00 - 9:00 a.m. or 4:00 - 6:00 p.m.) by standing beside the road away from an intersection (or somewhere in the middle of a block), on both sides of the street.

3. Results and Discussion

3.1 Travel Mode Selection

The travel mode pattern is one of the important pieces of information to assess the active transportation practices among the IIUM Pagoh Campus's students. The modes can be either walking, bicycling, riding a bus, a motorcycle, or a car. Figure 2 shows the outcomes of the questionnaire survey Part B.

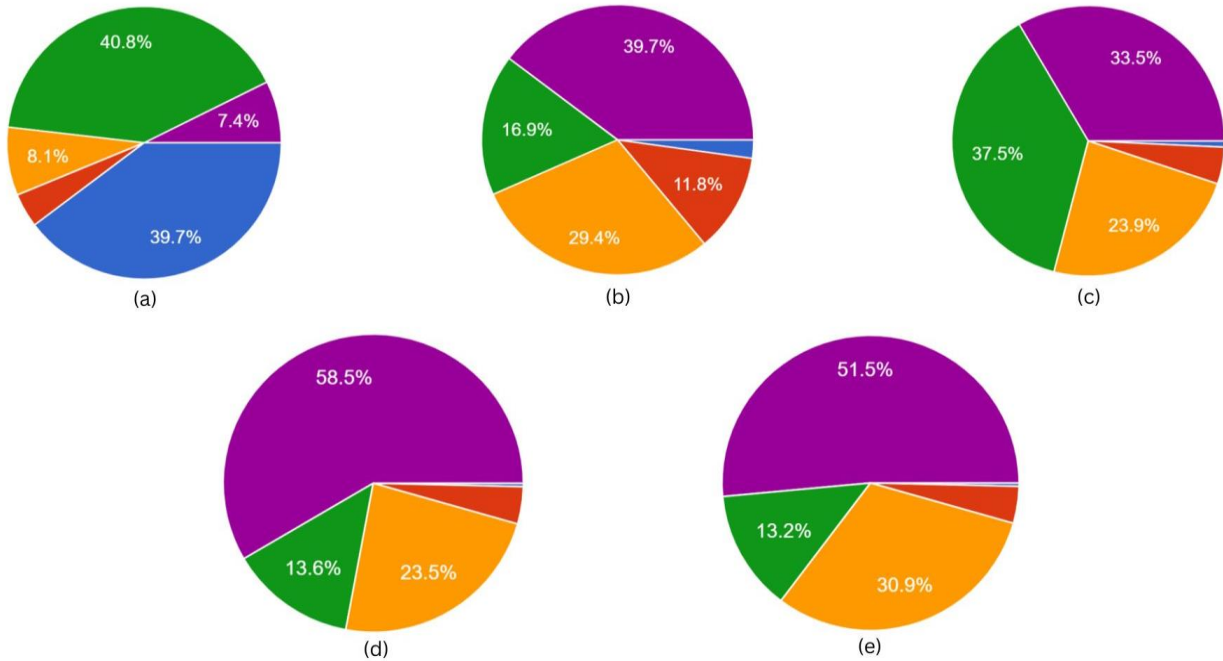


Fig. 2 Travel mode selection distance (a) less than 1 km, (b) 1 km-1.9 km, (c) 2 km-2.9 km, (d) 3 km-3.9 km, (e) more than 4 km

Referring to Fig. 2, walking and bicycling were unpopular modes of transport among the IIUM Pagoh Campus’s students. At distances greater than 2 km, the walking mode was barely selected among the students. Based on the estimated distance from the residential college to the campus of approximately 1.4 km, when compared to the responses in the questionnaires, it is not surprising that only a small number of students walk to their campus. Other modes were significantly increased in the selection proportionate to the distances and will not be discussed since the focus is on active transportation practices.

3.2 Walking and Bicycling Suitability Assessment

Fig. 3 shows the result of the walking suitability assessment along the IIUM students' typical walking route. Tables 4(a) and 4(b) show the results of walking and bicycling suitable assessment in terms of scores, condition, and explanation, respectively.



Fig. 3 Walking suitability assessment result along all segments of the investigated route

Table 4 (a)Result of walking suitability assessment; (b) Result of bicycling suitability assessment

(a)

Road Segment	Score	Condition	Explanation
1	99	Very poor	There were no sidewalks in this segment of the road to analyze.
2	5.25	Good	These sidewalks provide basic walking access but could be upgraded to improve the walking and wheelchair environments. Improvements might include enhancing the surface material or condition and installing more lighting.
3	11.25	Poor	For safe usage, these pavements need to be significantly improved. The replacement of unstable surfaces (such as gravel or dirt), the fixing of damaged sidewalk segments, the building of curb ramps for wheelchair access, or the creation of a continuous sidewalk on at least one side of the street are examples of these sorts of modifications.

(b)

Road segment	Point scores	Condition	Explanation
1	9.9	Very poor	There are a lot of dangers, a lot of cars, and poor road conditions on this road. None of the bicyclists are safe. It is important to make improvements.
2	8.7	Very poor	
3	10.4	Very poor	

From overall observation, the provision of walking and bicycling facilities existed along the route but at inconsistent conditions and not covered. This may be the contributing factor to why the students hardly practice active transportation. Meanwhile, based on the response of IIUM students, only 40 percent of students are willing to walk if the distance between their campus and college is less than 1 km. The result shows that the previous research studies were true that most people do not practice active transportation due to environmental conditions such as the weather. Since the weather in Malaysia is hot and rainy throughout the year and without proper facilities such as covered sidewalks, students prefer not to walk to the campus. The condition of interlocking pavement along the existing sidewalks along the main road also needs frequent maintenance to ensure safety while walking. Therefore, in the future, proper facilities should be built to help students practice active transportation.

4. Conclusion

In conclusion, all objectives were fulfilled although the response to the active transportation practices was not encouraging. Firstly, the travel mode selection among the IIUM Pagoh Campus’s students was determined with only 39.7 and 4 percent students willing to walk and cycle at less than 1 km, respectively. Secondly, the walking and bicycling suitability assessment based on the WABSA procedure was carried out along three consecutive road segments from the residential college to the campus and the scores show that most of the segments are in poor conditions that need immediate improvements. Finally, the recommendation for improvement was discussed in the previous section for action by the responsible authority.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

The authors confirm their contribution to the paper as follows: **study conception and design:** Muhammad Iswan Quzaimy Ahmad Redzuan, Nur Syuhada Aisha Sabarudin; **data collection:** Tuah Mikail Redza Mohd Rizan; **analysis and interpretation of results:** Muhammad Iswan Quzaimy Ahmad Redzuan, Nur Syuhada Aisha Sabarudin, Tuah Mikail Redza Mohd Rizan; **draft manuscript preparation:** Tuah Mikail Redza Mohd Rizan, Mohd Erwan Sanik. All authors reviewed the results and approved the final version of the manuscript.

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