

Is Mosul University Campus Comfortable for Walking?

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ABSTRACT

Universities worldwide are essential institutions to upgrade society. Recently, the University of Mosul underwent certain circumstances after the 2003 and 2016 times of wars that varied among urban expansion, renovation, and rebuild some affected or demolished buildings, roads, walkways, and sidewalks. Hereupon, this research aims at measuring students' comfort walking. This research contributes by advocating mobility network development on the main Campus. Six components involved with comfort walking were addressed namely: personal preferences, connectivity, accessibility, safety, convenience, and attractiveness. The study focused on the main Campus. Qualitative and quantitative approaches were adopted in data collection and analysis including observation, photography techniques, and questionnaire survey.

The sample of the study subjected the students who usually walk on the Campus. The findings reveal that the Campus generally gives the students a comfortable walking experience. Particularly, there is an agreement on connectivity aspects, moderate evaluation for accessibility aspects, agreement to some extent with safety aspects, moderate evaluation for convenience aspects, as well as attractiveness aspects. Besides, the findings indicate a requirement for further improvements especially in providing transportation services in the University for long distances, improving the physical elements, services, and facilities, which need more maintenance.

Keywords:

Campus, comfort walking, comfort walking components, comfort walking aspects.

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1. INTRODUCTION

Universities campuses worldwide are considered essential institutions to promote society [1]. They pledge to upgrade a conducive environment by fulfilling its functions of teaching and learning procedures [2], as well as being a space for social interaction where students, staff, and even visitors meet whilst walking, crossing, or standing with each other [3]. Despite campuses worldwide differing in scale and planning design, they demand active mobility networks that provide comfortable transportation, and hence lifestyle, for the university community [3], [4]. Since university campuses embrace a high population density of students, walking is considered the convenient and common means of transport, especially for students [5]. Walking is a daily activity on a campus where students move for short distances from one place to another [6], which can be recognized as a social, physical, or recreational activity [6], [7], [8], [9]. Walking

provides the interaction experience with the surrounding environment [10]. It releases stress and energy expenditure providing rest [11] and improving health [1], [5], [6], [7]. Besides, walking has many positive effects on the environment [6], [12], [13] by reducing the dependence on vehicles which leads to consuming energy leading to environmental concerns. Facilitating walking for pedestrians relates to qualities and design of urban spaces which determine the level of pedestrian's comfort of walking [14], [15]. Comfort is considered an essential demand in urban spaces and walkable built environments [15]. Many scholars describe comfort as a personal evaluation of the level of feeling that relates to convenience, ease, contentment, or pleasantness [14]. There is a link between comfort walking and walkable urban space aspects which are related to the connection of street and sidewalks, sidewalk quality, accessibility to facilities, traffic and transportation, safety, and attractive facades, etc. [12], [14], [16].

The main Campus of the University of Mosul comprises 19 colleges. Each college includes several departments. The general population of students on the main Campus is about 21500 students [17]. The students are not allowed to drive their private cars inside the Campus; therefore, walking is the main type of transport on the Campus. Students walking behavior on Campus becomes a habit, tradition, and decision. However, the Campus was exposed to several changes after 2003. Particularly, the urban area of the campus was expanding after the war in 2003 when many streets and sidewalks were established. In addition, the Campus undergoes several challenges and maintenance after the war in 2016 when many buildings were demolished or burned, and many sidewalks were affected. Noticeably, there are tremendous efforts to rebuild and design the urban spaces on the Campus. However, some upgrading works seem to be improper in some spaces, sidewalks, walkways, etc. Hereupon, the problem statement emerged. Evaluating students' satisfaction with comfortable walking on the Campus is needed through their walking experience. This research aims at measuring students' comfort walking on the main Campus of the University of Mosul. This research contributes by advocating mobility network development on the main Campus at the university of Mosul. To examine the comfort of walking, the mixed mode is adopted including observation and conducting a questionnaire survey from students.

2. LITERATURE REVIEW

Various studies attempted to address walking aspects in urban spaces generally, and on campuses specifically covering its components and aspects. According to [18], weather condition plays role in taking the decision of walking in a certain environment. Besides, [19] suggested that people prefer to walk as a type of sport and exercise. Both these aspects underly under personal preferences component.

The connectivity of streets and walkways is to be a significant component of providing comfortable walking on university campuses. [19] emphasized that walking is comfortable if sidewalks are near roads or streets. This statement is supported by the researchers [6], and [20]. According to [20], the presence of obstacles on the sidewalk affects walking comfortably. This is confirmed by the researchers [4], [5], [11], [13], and [18].

The previous studies pointed to accessibility to destinations and facilities on campus as an important component in upgrading comfort walking for students. [14], and [21] stated

that pedestrians feel comfortable when the ways they walk are well known. Moreover, [22] indicated that walking is considered comfortable if there are more than one way leading to the pedestrians' destination. This is asserted by the researchers [5], [9], [12], [19], and [21]. Students are required to commute to their classes daily, hence, reaching their destinations is crucial that can be easy by providing public transportation either outside or inside the campus. The researchers [4], [23], and [24] pointed to the importance of public transportation in asserting comfortable walking decisions, especially for far-distance travel on campus. This role of public transportation was supported by [6], [12], [15], [26], and [25]. According to [4], [6], and [22], comfort walking is related to accessibility to bus stations. Besides, [6] suggested that accessibility to the cafeteria improves the comfort of walking. [4] indicated that students feel comfortable walking when there is accessibility to university gates.

Furthermore, the presence of signs ensures comfort walking as they guide the students to their destination, as [4], [21], and [27] stated. [27] emphasized that trees along the street or sidewalks guide pedestrians and enhance the comfort of walking on the campus. This significant role of street trees was supported by [4], [5], and [11].

Recent studies recognized safety and security as an issue for students on campus while they are considered vulnerable street and crossway users. Many factors involve safe walking. [4] suggested that the design of sidewalks determines pedestrians' safety and hence comfort walking. This statement was agreed upon by the researchers [5], [14], [21], and [25]. Besides, [14] suggested that the presence of rails on sidewalks promotes comfort feeling and safety from vehicle accidents through walking. Besides, to achieve safety and comfort walking, the sidewalks should be continuous as [16] stated. Many researchers agree with this statement such as [4], [5], [6], [14], [18], [19], [24], and [27]. Continuity of the sidewalk ensures that the path of walking does not intersect with vehicle way. Hence, the walking is comfortable as being safe. Moreover, the presence of crossing signs on streets is another aspect of safety and comfort walking. [27] emphasized that crossing signs improve pedestrians' comfort and safety on campus streets. This is supported by [12], [14], [18], and [19]. Consequently, comfortable walking is associated with traffic safety from vehicle accidents as suggested by [12], [16], [19], and [26]. Security from crimes is considered one of the aspects of upgrading safety and security while walking that leads to strengthening feelings

of comfort walking as the researchers [9], [14], [15], [16], and [18] stated.

Many papers subjected convenience and comfort as substantial components of walking. Students are imposed with different levels of stress during their studies. Therefore, campuses as environments are required to relieve stress and provide convenience feeling while students walk, move, or stand [3]. According to [28], providing sidewalks with roofing or covering, or shelter walkways imposes convenient felling and comfortable walking where these roofs protect students from weather fluctuations or direct sunlight. This aspect is supported by [9], [12], [20], and [27]. Furthermore, [1], [4], [11], [12], [13], [15], [21], [25], and [28] suggested that sidewalks width is an important aspect in enhancing the feeling of convenience and comfort walking.

Table 1: The derivative aspects of comfortable walking components

Comfort walking aspects	Comfort walking components
Weather condition influence	Personal preferences
Walking for sports and exercises	
The sidewalk near roads and streets	Connectivity
Obstacles on sidewalk	
Well known ways	Accessibility
More than one way	
Providing public transportation	
Accessibility to bus stations	
Accessibility to cafeteria	
Accessibility to university gates	
Presence of signs	
Presence of trees	Safety and Security
Design of sidewalks	
Presence of rails	
Sidewalks are continuous	
Presence of crossing signs	
Traffic accidents	Convenience
Security from crimes	
Roofing, covering for sidewalks or shelter walkways	
Sidewalks width	
Cleanness of sidewalks	
Pavement condition	
Rubbish bins	
Gardens and trees	
Chairs	
Cafeterias	
Air quality	
sound insulators from vehicle noise	
Rest areas	
Public service	
Chairs design	
Fountains	
Sculptures	
Building facades design	

In addition, the cleanness of sidewalks is considered one of the aspects of comfort walking that has been addressed by [1], [4], [5], [11], [12],

and [29]. According to [1], [4], [5], [9], [12], [27], and [29], the pavement condition of the sidewalks is one of the aspects of upgrading convenience and comfort walking. In addition, [20] suggested that providing rubbish bins near sidewalks and sitting areas makes pedestrians feel convenient while walking. According to many researchers such as [4], [6], [9], [12], [15], [27], [28], [29], and [30], gardens and trees as being essential elements of campus green urban structure are upgrade convenience for pedestrians. Furthermore, the presence of chairs near the sidewalks and walkways for rest promotes a feeling of convenience and comfortable walking as [13], [12], and [27] asserted. Additionally, the existence of near cafeterias whilst walking on campus rises the feeling of convenience and comfortable walking according to [9], [13], and [20]. Besides, [27] and [31] suggested that air quality is one of the aspects of comfort walking. Moreover, [28] and [31] stated that the presence of sound insulators from vehicle noise advances convenience and comfortable walking.

Several studies highlighted that attractiveness is a significant component of comfort walking. According to [1], [9], [11], [13], [27], and [27], existing rest areas rises the feeling of comfort walking as they are considered attractive places. Likewise, public service act as attractive places on the campus that encourages comfortable walking due to [9], and [16].

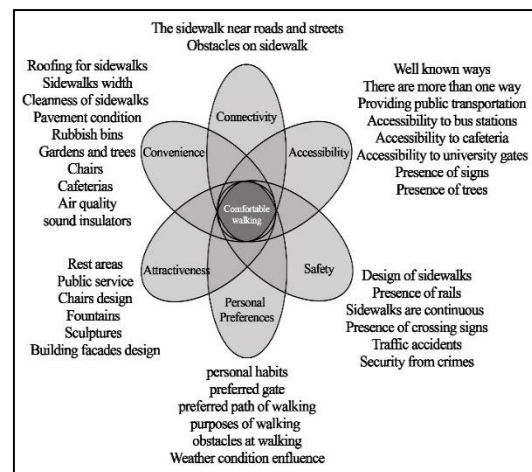


Figure 1: The framework synthesizes of comfortable walking components

Furthermore, attractive chair design enhances comfort walking according to [1], [11], [12], [27], and [28]. Fountains are attractive elements that improve comfort in walking according to [11], [12], [15], [20], and [27]. Besides, sculptures are also considered attractive

elements in campus open spaces as [11], [13], and [27] stated. According to [1], attractive building facades adjacent to walkways encourages pedestrians to walk. This statement was asserted by [6], [9], [11], [12], [14], [16], [20], [21], [27], and [29]. Table 1 indicates the derivative aspects of comfortable walking components from the literature review. Besides, Figure 1 illustrates the framework synthesizes of comfortable walking components.

3. THE PROPOSED METHODOLOGY

The University of Mosul was Established in 1967. It consists of 23 colleges. It has two Campuses. The first one is the main Campus which embraces 19 colleges. The second Campus includes 4 colleges. The research focuses on the main Campus as a case study. The research adopted a mixed method of data collection and data analysis. Many studies, such as [1], [3], [4], [5], [9], [11], [12], [14], [25], [29], and [32]; adopted a questionnaire survey tool to measure respondents' comfort walking, besides, observation technique is combined in some studies to validate the results.

The qualitative approach was employed by observation and photography techniques to subject the recent scenario of sidewalks at the Campus. Moreover, a quantitative approach was employed to evaluate the comfort of walking on the University of Mosul Campus by students. A questionnaire survey was designed by Google Forms as an instrument consisting of demographic questions, multiple choice questions close-ended questions, and Likert Scale questions. The questions were regulated in a hierarchy to gain the required data from the students.

The questionnaire survey was distributed to 18 colleges on the main Campus of Mosul University. Furthermore, two colleges belonging to Ninevah University located at the Campus of the University of Mosul were included which are the College of Medicine, and the College of Electronics Engineering. Many lecturers in different colleges were contacted to encourage their students to contribute to the questionnaire survey. Conducting the questionnaire survey was fulfilled within five months, particularly, from February to June 2021.

The research focuses on the students as a research sample. The students are not allowed to drive their private cars inside the Campus. Therefore, by their imposed walking, they present the proper sampling for the research study. The student population in 20 colleges at the Campus is around 21500 students. The number of respondents to the questionnaire survey was 1003 students. However, by neglecting errors, the sample size of

the research is 843 students, with a confidence level of 95% and 15.9% of sampling error. Noticeably, around 42.4% of the respondents are males, and 57.6% are females.

The analysis of the questionnaire survey data was fulfilled by Microsoft Excel. The Likert Scale data were analyzed by determining the mean and finding the interpretation of it depending on the following ranges: strongly agree ranged between 5 and 4.3, Agree ranged between 4.2 and 3.5, neither ranged between 3.4 and 2.7, disagree ranged between 2.6 and 1.9, and strongly disagree ranged between 1.8 and 1.

4. RESULTS AND DISCUSSIONS

The results include the questionnaire survey results and the existing scenario assessment, as follows:

4.1. Questionnaire Survey Results

The results are presented in parts. The first part addresses students' personal preferences and habits of walking. The second part explores the preferred gate to enter and exit the Campus. The third part reveals the reasons involved in comfort walking on the Campus. The fourth part shows an evaluation of comfortable walking components by the Likert Scale method.

4.1.1. The personal habits of walking

The results of the questionnaire survey show that about 84% (709 respondents) of respondents walk from the gate to the university on foot, while only 16% (134 respondents) of them tend to get in a car. As aforementioned that the students are not allowed to drive their private cars inside the Campus, they might be driven by a car or use university buses which take the students from the gates to their colleges in the morning only. In addition, the distance of daily walking was explored, as Figure 2 shows.

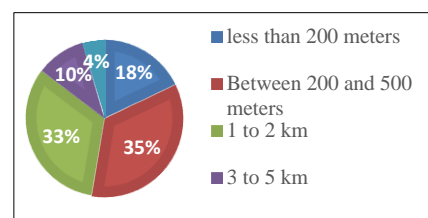


Figure 2: Distance of daily walking on the Campus

The results indicate that about 35% of respondents tend to walk between 200 and 500 meters daily on Campus. Around 33% walk 1 to 2 km. On other hand, only 4% of respondents like to walk 6km or more. About 18% and 10% seem to

walk less than 200 meters and 3 to 5 km respectively.

4.1.2. The preferred gate

The results determined that about 20% of respondents feel comfortable to enter the university Campus from the gate near the High School of Industry. Besides, about 18% prefer the gate near the Rectory of the University-the old buildings. Around 15% are comfortable using the gate near the Dean of Science College. Likewise, around 15% are using the gate near The Main Stadium. Besides, 14% of respondents feel comfortable to enter the university from the gate near the College of Density. This is the same as the percentage for those who prefer using the gate near Medical College-the second. In contrast, barely 4% of the respondents tend to enter from the gate near the Dean of Agriculture College. The results of the preferred gate are shown in Figure 3.

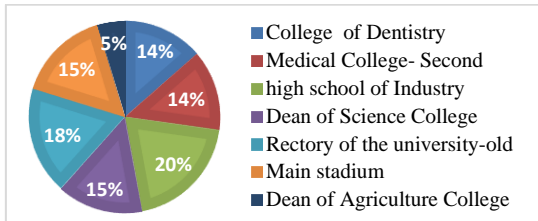


Figure 3: The preferred gate to enter the Campus

The percentage of students' number entering through the university gates depends on gate location and accessibility to certain proximate colleges and departments, as shown in Figure 4.

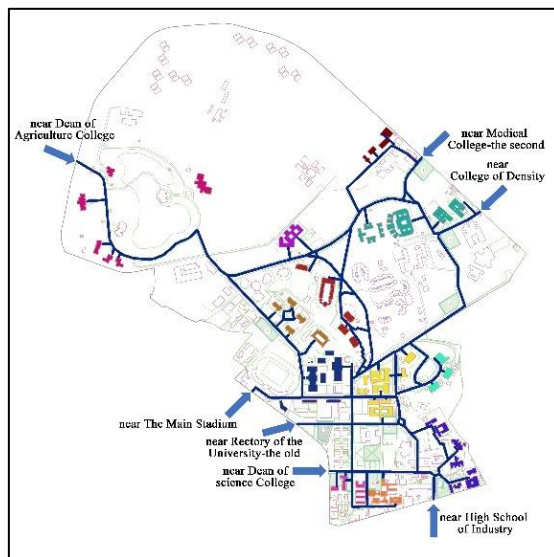


Figure 4: The location of the gates

The results of the questionnaire survey indicate that many reasons make students prefer to enter the university through a certain gate, as elucidated in Figure 5. The main reason is the proximity to the college which about 67% of students asserted. This is followed by about 24% of them confirming the proximity to the house reasonably. These two markable values are related to the accessibility component. Unlike three reasons got the lowest percentages which are 6% for safer walking, and 6% for proximity to shops and restaurants. Likewise, only 8% of respondents prefer accessing the gate due to the proximity to transportation inside the university.

Moreover, a slight percentage of respondents tend to feel comfortable choosing a gate because it is less crowded and in proximity to transportation outside the university at 18% and 15% respectively. With respect to the evaluation of reasons, accessibility is a more considerable component compared to safety and attractiveness.

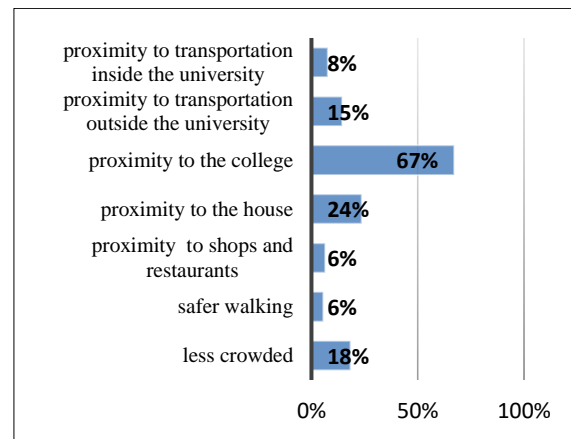


Figure 5: The reasons of entering from a gate

Figure 6 illustrates the results of the questionnaire survey addressing the preferred gate to exit the University.

About 23% of respondents feel comfortable exiting the University Campus from the gate near the High School of Industry. Moreover, around 16% preferred to exit from each gate which is near the Dean of Science College and near the Rectory of the University-the old buildings. Around 14% are using the gate near The Main Stadium, and the same percentage use the gate near Medical College-the second. About 13% are comfortable leaving the Campus from the gate near the College of Dentistry. Compared to the gate near the Deanery of Agriculture College, fewer students prefer to exit the university from this gate percentage of 4%.

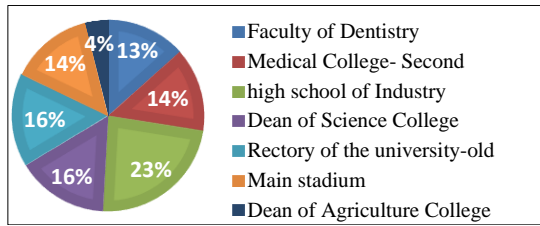


Figure 6: The preferred gate to exit the Campus

Meanwhile, the reasons that make students prefer to exit the University through a certain gate are varied as elucidated in Figure 7. about 50% of the respondents claim that they feel comfortable when they use the proximity gate to the college. Whereas about 29% and 28% prefer to exit from the proximity gate to transportation outside the Campus, and the proximity gate to their houses. In contrast, an inconsiderable percentage of students 7% pay attention to safe walking when they select a gate to exit the university. The convenience component scored around 19% where respondents tend to exit from the less crowded gate. Moreover, about 10% of the students exit the gates in proximity to transportation inside the University, and the same amount for proximity gates to shops and restaurants. Taking into consideration the comfort walking components, accessibility is the most important component compared to safety, convenience, and attractiveness.

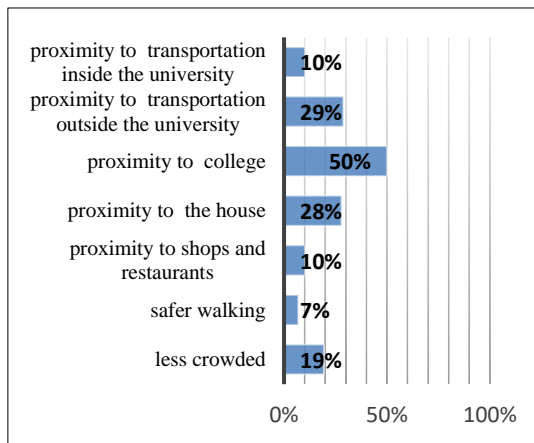


Figure 7: The reasons for exiting from a gate

4.1.3. The reasons and purposes for walking on Campus

Students usually choose a certain path to walk from the gate to the college or Student Housing Buildings. The results of the questionnaire survey show according to Figure 8, that 80% of the student would choose their road because it is the direct shortcut where the percentage of respondents rapidly reached 80%.

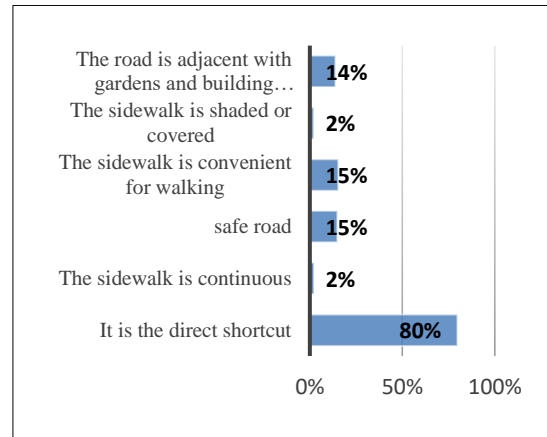


Figure 8: The reasons for choosing a walking path from the gate to the college

Discriminatingly, about 15% of respondents assert that they feel comfortable choosing their path due to the convenient sidewalk, and safety reasons. This is followed by about 14% of respondents who are comfortable walking on a road with adjacent gardens and attractive building facades. In contrast, only around 2% of respondents seek continuous sidewalks, and also 2% for shaded or covered sidewalks.

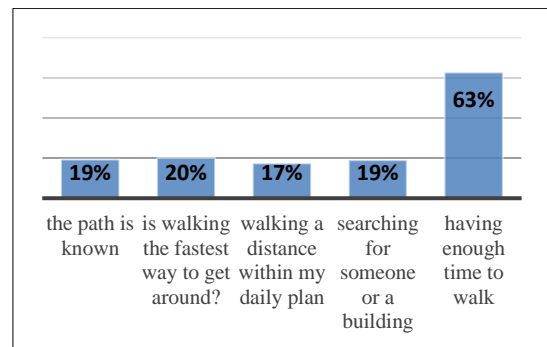


Figure 9: The reasons for motivating comfort walking

The questionnaire survey also subjected the reasons behind the motivations of comfort walking on the Campus, as illustrated in Figure 9. The results reveal that about 63% of the students are motivated to walk comfortably if they have enough time between lectures. In contrast, other reasons enrolled low values. About 20% of the respondents indicated that they are motivated to walk if it is the faster way to get around. Followed by 19% of students motivated to comfort walking if the path is known, and the same value for searching for someone or a building. Moreover, about 17% are motivated to walk comfortably because walking is part of their daily plan.

In addition, the obstacles that disserve comfort walking on the Campus were lunged in the questionnaire survey, as elucidated in Figure 10.

The results show that the main obstacle is having enough time to walk, where about 72% of respondents claim this reason. Climate conditions play role in comfort walking. Around 57% of respondents find that the unfavorable weather hampers their comfort walking. Moreover, around 49% clarify that the distance to and from the college building is very long. Besides, about 21% of respondents announce that the sidewalks are not suitable for comfortable walking. On other hand. In addition, about 21% of the students find out that the roads are not safe for walking.

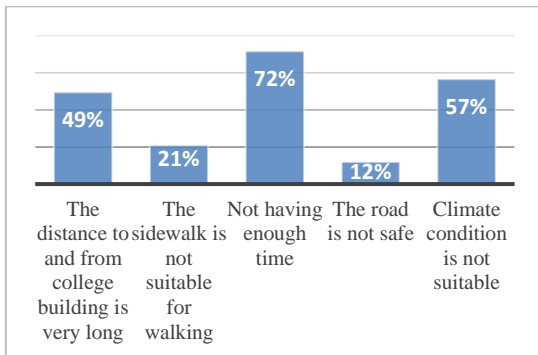


Figure 10: The reasons for disservice of comfortable walking

In addition, the purpose of walking on the Campus was explored by the questionnaire survey, as illustrated in Figure 11. The results show that the main purpose of walking is to get from and to the college building and vice versa, where the percentage of respondents is rapidly enrolled at 70%. The second markable purpose of waking on Campus is to go to the Students' Center and the nearby cafeterias, which scored around 52%.

Moreover, about 34% of students tend to have comfortable walking with their friends or by themselves hiking on Campus. Besides, about 28% and 23% of respondents claim that the purpose of their walking is going to another college building to meet friends, or to join lectures respectively.

Furthermore, moving from inside to outside the Campus or vice versa, and walking for exercise are two purposes that get around 19% and 14% respectively. The margined value is about 5% the purpose of students walking is to go to a nearby mosque.

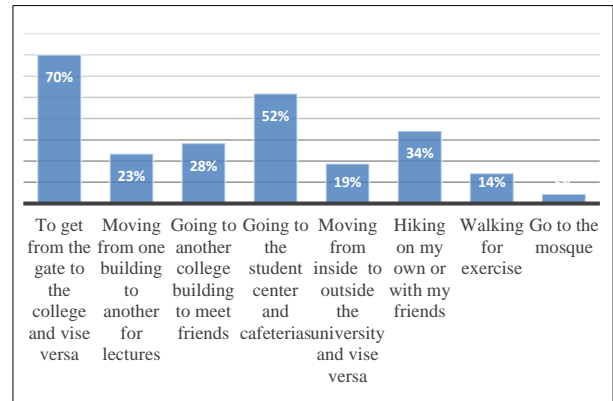


Figure 11: The purposes of walking on the Campus

4.1.4. The connectivity component Assessment

The five components of comfort walking are assessed, including connectivity, accessibility, safety and security, convenience, and attractiveness. Each component was examined by several aspects by the Likert Scale method. The means of data and also the final interpretations of each aspect were indicated.

Table 2: The results of connectivity aspects assessment

aspects	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	The mean	interpret ation
There are sidewalks on both sides of the street	249	483	59	34	18	4.0	Agree
Continuity of sidewalks or pedestrian paths	179	456	98	86	24	3.8	Agree
Obstacles on sidewalks or pedestrian paths	182	293	193	130	45	3.5	Agree
Pedestrian paths should be short to the destination	253	472	42	59	17	4.0	Agree
Sidewalks and pedestrian paths are close to the streets	187	502	102	38	14	3.9	Agree

The connectivity component was examined through five aspects, as shown in Table 2. The results show that the mean ranged between 4 and 3.5. Particularly, the two aspects of its means enrolled 4 are: there are sidewalks on both sides of the street, and pedestrian paths should be short to the destination. Moreover, the means that resulted at 3.9 and 3.8 are: Sidewalks and pedestrian paths are close to the streets, and Continuity of sidewalks or pedestrian paths, respectively. About 3.5 is the

mean for the aspect of obstacles on sidewalks or pedestrian paths. The interpretations for the five means are that the respondents agree with these aspects of connectivity. Accordingly, this indicates that the roads and sidewalks on the Campus meet connectivity aspects and achieve comfort walking on it.

4.1.5. The accessibility component Assessment

The accessibility component was assessed within ten aspects, as shown in Table 3. The results of the analysis show a discrepancy in the mean value that ranged from 4.1 to 2.7.

Table 3: The results of accessibility aspects assessment

aspects	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	The mean	interpretation
The ways are clear and well known	202	503	56	58	24	3.9	Agree
There is more than one way to get to a destination	300	423	78	28	14	4.1	Agree
It's a long way to reach a destination	232	286	85	208	32	3.5	Agree
Easily accessible to a nearby bus station	108	144	237	236	118	2.8	Neither
Easy access to nearby cafeterias	179	306	141	159	58	3.4	Neither
Easily accessible university gates	185	283	142	163	70	3.4	Neither
The presence of signs indicating the paths and directions to facilitate access when walking	125	111	195	229	183	2.7	Neither
There is a pedestrian sign at the intersection	51	193	244	239	116	2.7	Neither
The presence of tall trees at the intersection of the streets obstructs the view	72	85	260	322	104	2.6	Disagree
There are trees on the sidewalk that guide and direct the way	93	185	267	209	89	2.9	Neither

The respondents highlighted that there is more than one way to get to a destination. This aspect scored 4.1. Hence, the interpretation of this

means is that the students agree with this statement. Besides, the students agree with two aspects which are: the ways are clear and well known, and it is a long way to reach a destination by mean values of 3.9 and 3.5 respectively.

The two aspects related to the trees on Campus enrolled mean at 2.9 and 2.6 for aspects: There are trees on the sidewalk that guide and direct the way, and the presence of tall trees at the intersection of the streets obstructs the view, respectively. The interpretation for the first aspect is neither while the second is disagreed. In addition, the interpretation of the remaining five aspects means neither. Particularly, two means values are at 3.4, which are: easy access to nearby cafeterias, and easily accessible university gates.

Two means are at 2.7, which are: the presence of signs indicating the paths and directions to facilitate access when walking, and there is a pedestrian sign at the intersection. The respondents are neutral about the aspect of being easily accessible to a nearby bus station which scores 2.8 as the mean value.

4.1.6. The safety and security components Assessment

The results of the evaluation indicate varied in the mean value that revolved from 3.9 to 2.9 as indicated in Table 4. Generally, the interpretations can be divided into two groups. The first group includes six aspects with agree interpretation, while the second group comprehends four aspects with the interpretation of neither. The higher value of mean in the first group was acquired by the aspect: the design of the sidewalks and their width is safe for walking. This is followed by two aspects at a 3.7 mean value, which are some roads do not include sidewalks for pedestrians, and security from crimes. These results coincide with the existing scenario assessment that shows some roads do not include sidewalks for pedestrians. This results in unsafe and uncomfortable waking that may involve car and traffic movement. Moreover, the respondents agreed that pedestrian paths were separated by cars for most of the movement paths at a mean value of 3.6. Two aspects at 3.5 agreed by students that there is safety from traffic accidents on Campus and giving priority for pedestrians on streets without crosswalks. On the other hand, the aspect of giving priority to pedestrians on streets that do not have sidewalks, gains neither interpretation at 3.4 mean value. Likewise, the same value for the aspect: cars are slowdown at pedestrian crossings.

The mean value of 3.2 and 2.9 are for the aspects: there are rails between the sidewalk and the street, and there are clear crossing signs for

pedestrians on crossing streets. The existing scenario assessment did not assert these last two aspects. the observation indicated that there is a lack of rails to protect pedestrians from cars, and a lack of clear crossing signs on streets on the Campus.

Table 4: The results of safety and security aspects assessment

aspects	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	The mean	Interpretation
The design of the sidewalks is safe for walking	227	434	95	69	18	3.9	Agree
Pedestrian path separated by cars	187	370	121	130	35	3.6	Agree
There are rails between the sidewalk and the street for pedestrians' protection	139	231	223	188	62	3.2	Neither
Some roads do not include sidewalks for pedestrians	274	298	118	109	44	3.7	Agree
Safety from traffic accidents	165	302	222	107	47	3.5	Agree
There are clear crossing signs for pedestrians on crossing streets	137	187	141	278	100	2.9	Neither
Cars are slowdown at pedestrian crossings	194	266	164	131	88	3.4	Neither
Giving priority to pedestrians on streets without crosswalks	209	285	166	111	72	3.5	Agree
Giving priority to pedestrians on streets that do not have a sidewalk	200	287	169	108	79	3.4	Neither
Security from crimes	233	309	191	73	37	3.7	Agree

4.1.7. The convenience component Assessment

The convenience component was assessed within eighteen aspects. The results of the assessment indicate trends in the mean value that ranged from 3.7 to 2.5 as shown in Table 5. The respondents agreed with two aspects at 3.7 mean values, which are: there are green spaces around the buildings, and extensive gardens and trees provide comfort. Conversely, the students disagree that there are roofed or covered sidewalks to protect pedestrians from weather conditions at a 2.4 mean value. The remaining fifteen aspects have

neither interpretation ranged between 3.4 to 2.7 mean value, which subjects the sidewalks, the pavement, the rubbish bins, rest areas, cafeterias, bus stops, clean air, noise insolation on construction areas, and car parking.

Table 5: The results of convenient aspects assessment

aspects	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	The mean	Interpretation
There are roofed or covered sidewalks to protect pedestrians from weather conditions	88	106	141	247	261	2.4	Disagree
The sidewalk is wide to avoid crowding	184	203	144	172	140	3.1	Neither
The sidewalk is clean	170	285	183	134	71	3.4	Neither
The sidewalk does not contain obstacles (such as rubble, rubbish, poles, and rubbish bins)	158	232	197	178	78	3.2	Neither
Pavement condition is good (unbroken, continuous maintenance)	154	256	180	175	78	3.2	Neither
Rubbish bins are at suitable places	159	298	169	146	71	3.3	Neither
Rubbish bins have acceptable shapes	152	204	178	236	53	3.1	Neither
There are green spaces around the buildings	220	348	143	84	48	3.7	Agree
Extensive gardens and trees provide comfort	223	340	139	92	49	3.7	Agree
There are long trees that provide shading along the street	166	249	92	163	173	3.0	Neither
There are rest areas to sit and wait along the way	190	261	177	131	84	3.4	Neither
There are enough chairs in the rest areas	129	177	101	215	221	2.7	Neither
There are cafeterias for rest and food along the way	158	303	106	197	79	3.3	Neither

There are enough cafeterias	146	254	186	167	90	3.2	Neither
There are enough bus stops	137	252	108	242	104	3.0	Neither
The air is clean and not polluted by car smoke	177	301	168	139	58	3.4	Neither
The presence of sound insulators in noise areas, especially construction areas	124	182	109	287	141	2.8	Neither
Car parking is designed and adequate on the Campus	149	162	197	159	176	2.9	Neither

4.1.8. The attractiveness component Assessment

The results of the evaluation show discrepancy in the mean value that ranges from 3.6 to 2.5 as shown in Table 6. The students agreed at 3.6 and 3.5 mean values with the aspects: roads are close to public service areas such as the Students' Center, and the presence of small stopping points for rest including chairs, respectively. In contrast, the respondents disagree with the aspect of the presence of a beautiful artistic monument or sculpture on the Campus.

Table 6: The results of attractiveness aspects assessment

aspects	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	The mean	Interpretation
The presence of small stopping points for rest includes chairs	208	307	145	115	68	3.5	Agree
Roads are close to public service areas such as the Students' Center	180	368	164	90	41	3.6	Agree
The roads are close to bus stops and bus traffic	158	292	209	117	67	3.4	Neither
The chairs are attractive and comfortable	144	226	188	191	94	3.1	Neither
There are attractive fountains that you see while walking	144	208	129	197	165	2.9	Neither
Presence of a beautiful artistic monument or sculpture on the Campus	120	108	118	279	218	2.5	Disagree
Building facades are beautiful and attractive	159	312	185	118	69	3.4	Neither

These results meet the existing scenarios assessment. Furthermore, four aspects get neither interpretation. Two aspects have a 3.4 mean value, which are the roads are close to bus stops and bus traffic, and the building facades are beautiful and attractive. Moreover, two aspects which are: the chairs are attractive and comfortable, and there are attractive fountains got 3.1 and 2.9 mean values respectively.

4.2. The Existing Scenario Assessment

This assessment involves the results of the observation technique that support the results of the questionnaire survey, as follows:

4.2.1. Observing personal preferences aspects

The students observationally tend to walk, hang, and sit at the rest areas and gardens under suitable weather.

4.2.2. Observing the connectivity component

It is observed that the majority of streets have sidewalks on both sides. Sidewalks and pedestrian paths are close to the streets, and they were designed to be direct and short to department buildings. However, not all the sidewalks appear to be continuous. No considerable obstacles on pedestrian paths were noticed, as elucidated in Figure 12.



Figure 12: The connectivity of streets on Campus

4.2.3. Observing the accessibility component

The design of the mobility net at the Campus includes main clear streets with more than

one way to get to the buildings and facilities. Regarding the size of the site of the Campus, it is observed that it can be a long way to transport from one destination to another or to get to the gates of the university.

Students tend to enter the university from the gates that provide direct or short distances to their destinations. Hence, the gates near the High School of Industry, and the gate near the Rectory of the University-the old buildings receive the highest number of students since they are accessing many different departments' buildings.

Besides, the gate near the Deanery of Science College, the gate near the Main Stadium, the gate near the College of Dentistry, and the gate near Medical College-the second receive a high population of students. In contrast, the students seem to avoid entering the gate near the Deanery of Agriculture College because it is far from many Student Housing Buildings.

Moreover, a number of bus stations and cafeterias are prepared to serve the surrounding buildings and they are easily accessible. A lack of signs on paths or intersections is observed that facilitate access when walking. Besides, the streets include a few tall trees, and sidewalks contain or are adjacent to trees that guide the way, as illustrated in Figure 13.



Figure 13: The accessibility of streets in the on Campus

4.2.4. Observing the safety and security component

Some sidewalks were designed with adequate width; however, they include trees or

light poles in the middle of their width which contributes to inconvenient walking. Consequently, pedestrians are imposed to walk on streets instead of sidewalks. Besides, some streets do not include sidewalks. There are no rails between the sidewalk and the street to protect pedestrians while walking.

There is an absence of crossing signs for pedestrians on crossing streets, as shown in Figure 14. These expose pedestrians to traffic accidents. However, priority is given for pedestrians on the streets. Obviously, the Campus is safe and secure from crimes.

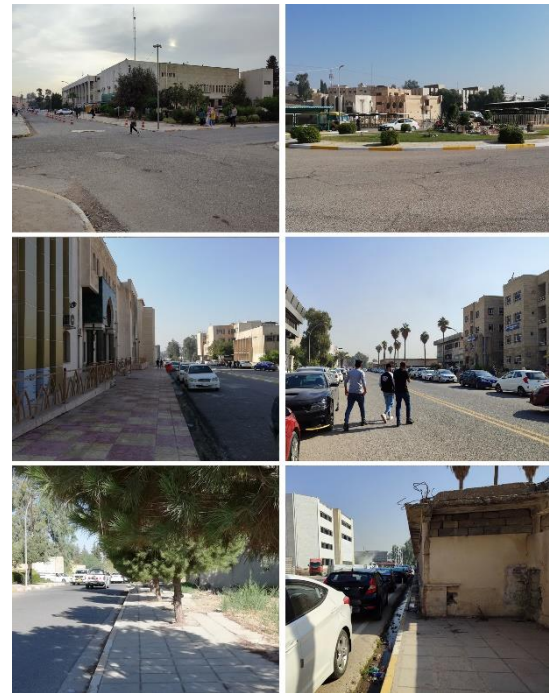


Figure 14: The safety of streets in the Campus

4.2.5. Observing the convenient component

The assessments indicate that generally, the sidewalks are wide, clean, and with acceptable pavement. However, in some points, some sidewalks contain obstacles such as trees, poles, and rubbish bins. Besides, there is an absence of shelter, or roofed sidewalks to protect pedestrians from weather conditions. Besides, some sidewalks are not continuous. Therefore, the percentage comes out low. Many rubbish bins are distributed near the sidewalks and rest areas; however, they varied in shape, size, and place as being suitable, acceptable, or not. The Campus urban space was designed with extensive gardens and yards around the buildings to provide comfort while walking and sitting. At some sidewalks, long adjacent trees were planted to create shading along the way.

Many rest areas for sitting and waiting at the Campus were observed but some do not include

adequate chairs. Likewise, there is a presence of many cafeterias for rest and food along the way differing in design and area. Besides, enough bus stops were observed distributed on the Campus. However, there is a lack of sufficient car parks where many cars were parked on both sides of the streets. In addition, there is a lack of sound insulators in noise areas, especially construction areas. According to air quality, the air generally is clean, as illustrated in Figure 15.

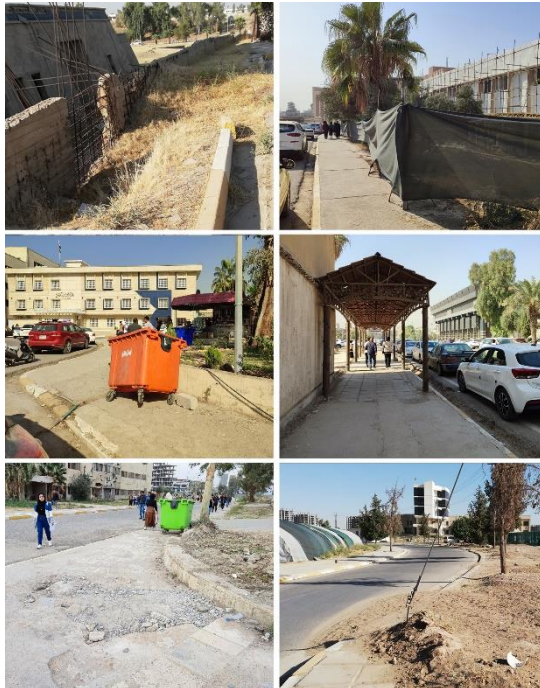


Figure 15: The convenience of streets in the Campus

4.2.6. Observing the attractiveness component

The roads are close to public service areas such as the Students' Center that advocate it to be attractive to walk on it. The roads are close to bus stops and bus traffic. Besides, the observation assessment shows the presence of small stopping points for rest including chairs. However, the design of the chairs differs from one place to another. Some open areas include designed and attractive chairs such as near the side courtyard of the College of Basic Education, and the College of Archaeology, while the designed chairs near the side courtyard of Dams and Water Resources Engineering Department, and Geology department are not attractive. On other hand, some Departments do not have chairs in surrounding yards or open spaces such as the Quran Sciences Department, and Department of Geography. In addition, a few undesigned fountains and simple artistic sculptures were observed on Campus

while walking such as in front of the College of Education for Humanities. Moreover, building facades are designed and maintained, as elucidated in Figure 16.



Figure 16: The attractiveness in the Campus

4.3. Suggestions to improve comfort walking on the Campus

In this part, respondents offer the needed maintenance and improvements for the university Campus through a range of suggestions presented by the questionnaire survey, as shown in Figure 17.

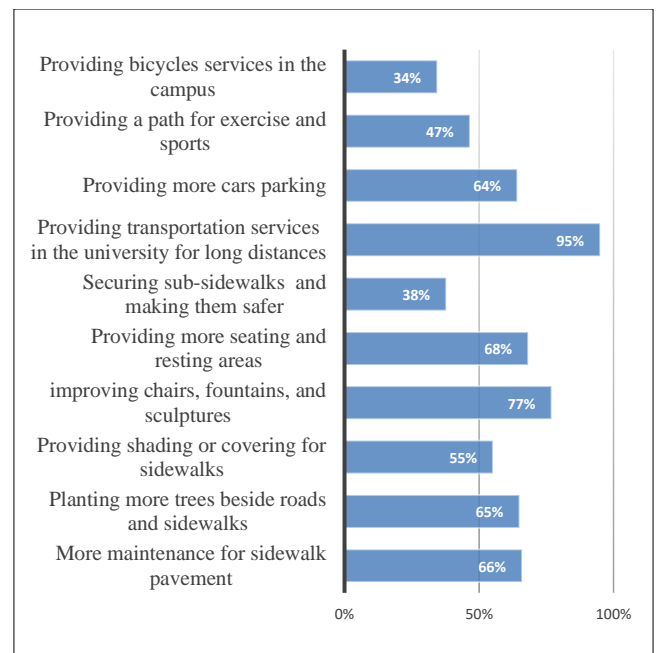


Figure 17: Suggestions to improve comfort walking on the Campus

In general, most students indicated the need for providing transportation services at the university for long distances. The percentage is about 95% of respondents. This percentage relies on students' uncomfortable walking for long distances especially when they must join a certain lecture at a specific time. Therefore, the need for transportation services from the gates of the Campus to all Colleges and Student Housing Buildings buildings and to be available from early morning till the end of lectures time at the University which is about 3 pm. Disparately, about 77% of respondents impose the need to improve the physical elements such as chairs, fountains, and sculptures. These physical elements upgrade convenient and attractive aspects; and hence, improve the comfort of walking. Four suggestions ranged between 68% and 64% which in descending manner are providing more seating and resting areas, more maintenance for sidewalk pavement, planting more trees beside roads and sidewalks, and providing more car parking. These results assert the results of the existing scenario assessment. Along the inadequate car parking, some cars are parked on wide sidewalks that prevent comfortable walking.

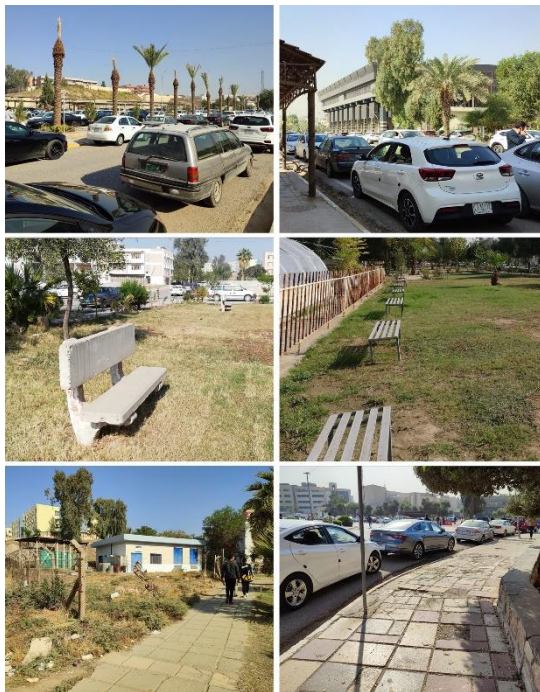


Figure 18: The essential aspects been recommended

Moreover, around 55% of respondents detected that sidewalks need to be shaded or

covered to protect pedestrians from different weather conditions. Obviously, the existing scenario assessment reveals a lack of shading or covering for sidewalks on the Campus. In addition, the results indicate the extent of students' interest in exercising and sports. About 47% and 34% of students suggest providing a path for exercise and sports and providing bicycle services at the Campus to be used by students to transfer from one place to another. For safety aspects, only 38% of respondents claim that sub-sidewalks need to be secured to be safer.

Figure 18 illustrates the essential aspects recommended in the suggestions.

5. CONCLUSION

The empirical findings of this research provided significant implications for further developments on walkability on campuses. Campuses demand active mobility networks that provide comfort transporting for students. The findings offered various potentials for improvements that would encourage walking on campuses. This involves physical elements on walkways and open spaces. Besides, students' preferences and walking habits are important to be considered. This would improve the function of campuses not only as a conducive environment, but as an active, vital, and social environment too. Moreover, this study provided numerous considerations for a sustainable campus. Walkability or comfortable walking on campuses is one of the sustainability aspects. Recently, there are significant attempts at the University of Mosul to meet sustainability aspects. The findings of this study outlined the variable of a sustainable walkable environment on campuses. The University of Mosul is in a central area of a major city. It is considered that the optimum organization in it. Therefore, it is crucial to improve its environment and enhance its maintenance.

6. Recommendations of the Study

The findings proved the necessity to conduct a periodical assessment of the students on the University management to address students' difficulties and suggestions aiming to provide better improvements to their Campus and enhance their comfort walking. According to the findings, the study recommends to:

1. Provide transportation services in the university for long distances.
2. Provide shading or covering for sidewalks protecting from weather conditions.
3. Provide more seating and resting areas.
4. Improve the design of chairs and seating.

5. Improve the design of fountains and sculptures.
6. Plant more trees beside roads and sidewalks.
7. Provide more car parking.

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الملخص

تعتبر الجامعات في جميع أنحاء العالم مؤسسات رئيسية تساهم بالارتقاء بالمجتمع. مؤخرًا، شهدت جامعة الموصل بعض التحديات بعد حروب عامي 2003 و 2016 تباينت بين التوسع العمراني، تجديد وإعادة بناء بعض المباني، الطرق، ممرات الحركة، والأرصعة المتضررة أو المهتمة. بناءً على ذلك، يهدف هذا البحث إلى قياس راحة المشي لدى الطلاب. تكمن أهمية البحث في مساهمته من خلال الدعوة إلى تطوير شبكات التنقل في الحرم الجامعي. تناول البحث ستة جوانب رئيسية للمشي المريح وهي: التفضيلات الشخصية، الاتصالية، الوصولية، السلامة، الراحة، والجاذبية. تم اعتماد الأساليب الكمية والنوعية في جمع البيانات وتحليلها بما في ذلك تقنيات المراقبة والتصوير وجمع الاستبيانات. ركز البحث على طلبية الجامعة كعينة دراسية والذين عادة يمارسون فعالية المشي في الحرم الجامعي بشكل كبير. أظهرت النتائج أن الحرم الجامعي يمنح الطالب بشكل عام تجربة مشي مريحة. تفصيلاً، هناك اتفاق على عوامل اتصال الطرق، تقييم معتدل لعوامل إمكانية الوصول، الاتفاق على بعض العوامل المتعلقة بالسلامة، والتقييم المعتدل لعوامل الراحة، فضلاً عن التقييم المعتدل لعوامل الجاذبية. فضلاً عن تشير النتائج إلى الحاجة إلى مزيد من التحسينات من حيث توفير خدمات النقل في الجامعة لمسافات طويلة، تحسين العناصر المادية في الفضاء الحضري، تحسين الخدمات، وتوفير المزيد من الصيانة للأرصعة والفضاءات الخارجية.

الكلمات الدالة :

الحرم الجامعي، الراحة عند المشي، جوانب الراحة عند المشي، عوامل الراحة عند المشي.