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Pedestrian profile and perception of walkability in Hêvié, Ouèdo, and Togba in Abomey Calavi, Republic of Benin in West Africa

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Abstract: The positive perception of walkability ensures more frequent and continuous use compared to a high objective level of walkability. In a context of increasing traffic-related air pollution, it is important to find alternatives to motorized transport, at least for short distances. This issue is even more important in peri-urban areas, where distances are long and roads are poorly designed. Pedestrian profiles also play a key role in the perception of walkability. The present study examines the perception of walkability and assesses its relationship with the profile of peri-urban dwellers in the Republic of Benin, in the Hêvié, Ouèdo, and Togba districts of the Abomey-Calavi municipality. To this end, the Neighborhood Environment Walkability Scale - Abbreviated (NEWS-A) questionnaire was adapted, and 117 pedestrians randomly selected in the study area were questioned between October 6 and 10, 2024, at different times of the day. The data processing allows us to understand that the perception of walkability is evaluated through six criteria: Aesthetics/attractiveness, Access, Comfort, Safety, Connectivity, and Inclusivity. In addition, pedestrians generally have a poor perception of walkability. Pedestrians' gender significantly influences their perception of aesthetics/attractiveness, comfort, and connectivity. In parallel, income significantly correlates with perceptions of accessibility, comfort, and connectivity.

Keywords: *Abomey-Calavi, Active mobility, Pedestrian, Perceived walkability, Periurban.*

1. Introduction

The choice of transportation mode depends on several criteria [1]. One of the criteria for choosing a mode of transport is the diversity of transport services. In the districts of Hêvié, Ouèdo, and Togba in Abomey-Calavi, the main means of transportation are walking, motorcycles and cars [2]. Motorized transport is highly polluting, and its consequences for nature and human health have been widely documented in the literature [3]. Walking is the least polluting of the main modes of transportation used by the inhabitants of Hêvié, Ouèdo and Togba. Nevertheless, the pedestrian potential is considered a "need to know" rather than an "essential" in the process of sustainable development of urban environments [4]. Cette position de la marche à pied est justifiée aussi bien pour son intérêt pour la santé, pour l'économie, que pour l'inclusion. This position is justified by the health, economic and social benefits of walking. Walking is one of the few physical activities that can be performed by people of all ages [5, 6] and has a wide range of health benefits [7].

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The transport sector is the second largest emitter of carbon dioxide (CO2) in the world and accounted for 15% of global carbon dioxide emissions in 2023 [8]. In the Republic of Benin, the transport sector has increased from 200.54 Gg CO2 eq in 1990 to 4622.58 Gg CO2 eq in 2015, accounting for 59.32% of total carbon emissions (including forestry and other land use) in the Republic of Benin [9]. Similarly, in this West African country, transport-related emissions increased sixfold between 2000 and 2021 [10]. In this context, it is useful to consider different options for reducing transport-related emissions. The notion of walkability, a key theme in urban studies, is strongly linked to health and social equity, but most importantly to environmental sustainability [11]. In order to reduce the negative externalities associated with transport, walking needs to be given a more prominent role. The realities underlying the use of walking in peri-urban areas in developing countries are poorly understood [12-14] and even less in the Republic of Benin.

One of the various criteria for choosing a mode of transport is the perception of each available mode [15]. The present study investigates the perception of the potential of walking by the inhabitants of peri-urban areas in the Republic of Benin, and the correlation between this perception and the pedestrian profile. The Hêvié, Ouèdo and Togba districts of the Abomey-Calavi municipality in the Republic of Benin were chosen as the study area. First, it seeks to understand the factors involved in the perception of walkability. Second, it assesses pedestrians' perceptions according to these factors. Finally, it examines the correlations between perceived walkability and respondent profiles, in order to open up avenues of reflection on how to improve the practice and commitment of pedestrians to regular walking.

2. Theoretical Approach to Assessing Walkability

Walkability is defined as the degree to which the built environment welcomes pedestrians, makes it easy for them to get around on foot, and leads to health benefits for residents and an increase in the quality of urban life [16, 17]. According to Knapskog, et al. [18] walkability is the degree to which cities, neighborhoods, lanes or streets are attractive for walking, as well as pleasant, inviting and conducive to walking. Walkability is a set of skills specific to each neighborhood, manifested in urban characteristics under three main aspects: the density (concentration) of buildings and inhabitants, the mix of various services and attractions, and the access network used to move between these [19].

The concept of walkability is extensively covered in the existing literature. Various studies have defined factors/criteria for walkability. Although walkability is a multi-disciplinary and multi-dimensional concept [16] various fields have defined factors to help understand and assess it. For San Francisco Planning and Urban Research Association (SPUR) [20, 21] walkability principles are: 1) Create finely structured pedestrian circulation; 2) Orient buildings towards the street and open spaces; 3) Organize uses to support public activity; 4) Place parking behind or under buildings; 5) Take into account human scale in building and landscape details; 6) Provide clear, continuous pedestrian access; 7) Construct complete streets. According to Jeff Speck's general theory of walkability [22] there are four (04) conditions to make a city walkable: 1) Usefulness (proximity to places of interest); 2) Safety; 3) Comfort; 4) Interest/attractiveness (buildings must have attractive facades and express signs of humanity). For ITDP and UN-Habitat [23] comfort, continuity, and safety are the criteria for the design and construction of pedestrian facilities. According to Dovey and Pafka [19], walkability is assessed under three main aspects which are: density, functional mix and attractiveness, and accessibility.

The literature highlights two types of walkability [20, 21]: objective walkability and perceived walkability. A variety of methods are used to assess each of these two types of walkability.

2.1. Assessing objective walkability

To assess the objective walkability, there are several methods [24] as referenced in Table 1 below.

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Table 1.
Measuring "Objective Walkability"

Methods	Descriptions	Factors taken into account	Authors who used
Walk Score	Go to Walkscore.com and select a location for data on walking opportunities in that area (data is more detailed in the USA and Canada).	_	Walkscore.com
Walkability Index	Deploy accelerometers over a while to objectively measure the physical activity levels of residents in a given area. Then use this GIS-based data to evaluate the Pedestrian Potential Index.	- Residential density - Land use diversity - Connectivity	Ki, et al. [25]
Walk opportunities	Information on the selected facilities is combined with a weighted intersection index. Possible destinations are evaluated according to distance, size, and importance. The walking opportunity index is composed of the sum of the weighted intersection z-score and the "everyday" retail z-score.	- Security - Connectivity - Street design.	Wang and Yang [24]
Pedsheds Connectivity	A circle of 400 and/or 800 m is drawn around a public transit stop that requires a 5- and 10-minute walk, respectively. The pedshed indicates the percentage of the circle that is accessible.	- Safety - Sidewalk connectivity - Street design.	Porta and Renne [26]

2.2. The different methods used to assess perceived "walkability"

Recent studies have shown that walking is not only influenced by objectivity, but that several subjective elements are involved in the choice of walking use [14, 27].

De Vos, et al. [21] believe that perceived walkability is the perception of how easy it is to get around on foot (in an area or to places). Several methods have been developed to assess this perception. It's difficult to generalize about the importance of one factor over another, as it varies from person to person, depending on their experience and personality [4]. The analysis of perception, which is a subjective aspect that varies from one individual to another, requires the use of survey methods [15].

In the following Table 2, we specify the methods used to measure perceived walkability in order to make a choice within the framework of this study.

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Table 2.
Measure of Perceived Walkability

Perceived Walkability			
Methods	**Descriptions**	**Factors taken into account**	**Authors who used**
Neighbourhood Environment Walkability Scale (NEWS)	With fairly detailed questions (83 in all), residents are asked about access to services, streets, residences, sidewalk design, the environment, safety, crime, and satisfaction with 17 neighborhood characteristics.	- Security / Crime - Comfort -Accessibility / Proximity to amenities - Attractiveness / Environment	Suarez-Balcazar, et al. [28]
Neighbourhood Environment Walkability Scale - Abbreviated (NEWS-A)	Seven analysis factors are considered. These are residential density, land use diversity, street connectivity, sidewalk design, aesthetics, traffic safety, and crime.	- Security / Crime - Comfort - Accessibility / Proximity to amenities - Attractions / Environment	Al-Hazzaa, et al. [17]; Jensen, et al. [29] and Lui and Wong [30]
Neighbourhood Environment Walkability Scale - Youth (NEWS-Y)	An adaptation of the Neighbourhood Environment Walkability Scale for adolescents. In addition to other criteria, it takes into account the availability of recreational facilities.	- Security / Crime - Comfort - Accessibility / Proximity to amenities - Attractions / Environment	Hinckson, et al. [31]
Leyden Walkability Instrument (LWI)	Residents are asked if they can walk to nine pre-selected types of equipment. They are then asked to rate their walkability out of 9 based on the number of devices they can access.	- Accessibility and proximity to amenities ;	Morales-Flores and Marmolejo-Duarte [32]
Physical Activity Neighbourhood Environment Scale (PANES)	Participants are asked to rate their agreement with 17 statements related to residential density, land use mix, street connectivity, proximity to amenities, pedestrian and bicycle infrastructure, and traffic safety.	- Security / Crime - Comfort - Accessibility / Proximity to amenities - Attractions / Environment	Calise, et al. [33]
Others	Requesting the degree of agreement from respondents. Regarding remarks on the home setting and the convenience of walking	- Comfort - Accessibility / Proximity to amenities.	Consoli, et al. [20] and Adkins, et al. [34]

3. Materials and Methods

The methodological approach used in this study is mixed, focusing mainly on qualitative values. A literature review was carried out to identify the main criteria on which walking potential is based. Based on these criteria, the NEWS-A questionnaire was adapted to assess the perceptions of the inhabitants of Hêvié, Ouèdo and Togba regarding the walking potential of their environment. As the study focuses on residents' perceptions, the qualitative data collected were translated into quantitative data to facilitate analysis.

3.1. Study Area : Hêvié, Ouèdo, Togba

The study area includes the districts of Hêvié, Ouèdo and Togba, three of the districts of the Abomey-Calavi municipality in the Republic of Benin. They have all the characteristics of a peri-urban area, with an estimated population of 327,544 in 2022 and a surface area of 121 Km² [2]. As shown in Figure 1, the site is bounded to the north by the arrondissement of Glo-Djigbé and the commune of Tori-Bossito, to the east by the arrondissement of Abomey-Calavi, to the south by the arrondissement of Godomey and to the west by the communes of Tori-Bossito and Ouidah.

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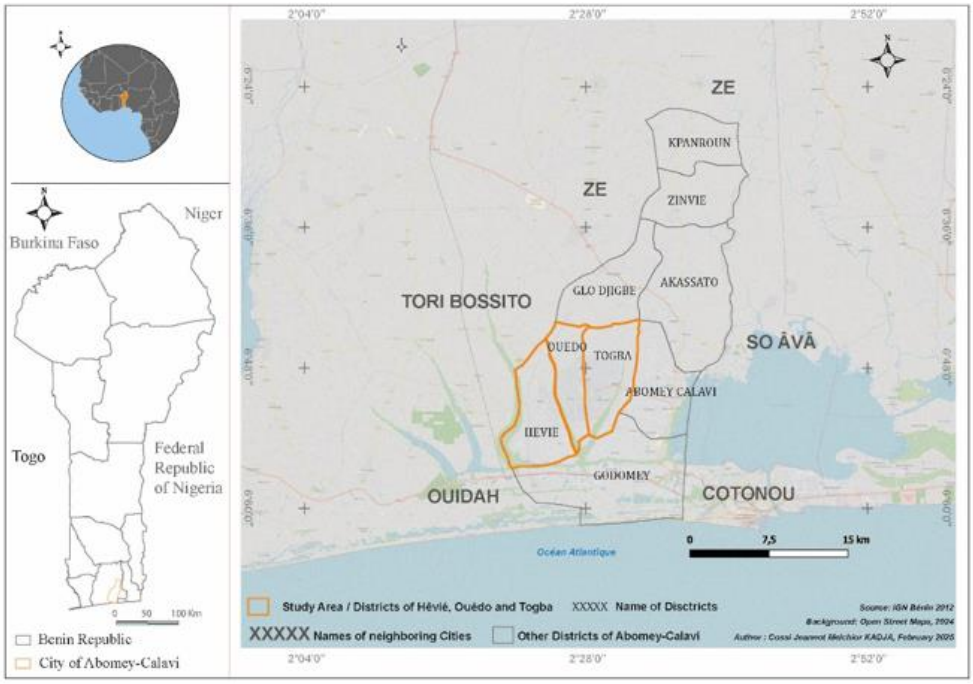

Figure 1.
Location Map - Hêvié, Ouèdo and Togba in Abomey-Calavi

3.2. Walkability analysis criteria

From Tables 1 and 2 and the work of Jeff Speck, SPUR, ITDP and UN-Habitat, as well as the universal pedestrian potential analysis tool from the Irish National Transport Authority, the factors affecting the walking potential of a neighborhood are diverse [22, 23, 35, 36]. These can be grouped into six (06) categories: 1) Aesthetics/Attractiveness; 2) Access; 3) Comfort; 4) Connectivity; 5) Inclusivity; 6) Security. These six categories are the ones considered in this study.

3.3. Survey

The methodological approach Neighbourhood Environment Walkability Scale - Abbreviated (NEWS-A), already used in various studies of perceived walkability, was chosen for this study Blackwood, et al. [13]; Al-Hazzaa, et al. [17]; Jensen, et al. [29] and Lui and Wong [30]. This method was used in the present study not only because of its relevance to the indicators under consideration but also because of its ease of comprehension by the respondents. However, for this study, the proposed NEWS-A questionnaire was adapted [17, 29] by adding the factor "inclusiveness" and by adding questions related to the criterion "comfort". We have a total of 25 questions divided into 06 factors/criteria. For each question, a score from 1 to 4 is given according to the respondent's answer: (1) Poor; (2) More or less acceptable; (3) Good; (4) Very good. To interpret the survey averages, the study uses the following classification:]1 - 1.5] = Negative Opinion;]1.5 - 2] = Unsatisfactory;]2 - 2.5] = Moderately Positive Perception;]2.5 - 3] = Overall Satisfactory;]3 - 3.5] = High Satisfaction;]3.5 - 4] = Very Satisfactory.

The table annexed to this document presents the questionnaire used in the present study on pedestrians' perceptions of the potential for walking in Hêvié, Ouèdo, Togba, Abomey-Calavi, Republic of Benin.

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3.4. Survey Sample

To define the sample size, we used Slovin's formula with a margin of error of 10%. This formula was applied to the population of regular walkers [2]. This formula gives a sample size of 100. A total of 117 people were interviewed, distributed throughout the country according to the demographic weight of each arrondissement. The additional population was interviewed to increase the representativeness of the sample. The breakdown of the sample is shown in Table 3 below.

Table 3.
Distribution of respondents

District	Number of respondents	Percentage (%)
Hêvié	47	39.99
Ouèdo	19	16.38
Togba	51	43.63
Total	117	100

3.5. Collection and Analysis

Data were collected in the field using Kobocollect software. The questionnaire was administered randomly to pedestrians in Hêvié, Ouèdo and Togba from 6 to 10 October 2024. The random method was chosen to increase the reliability of the results and to define the general profile of pedestrians in the study area. The collected data were filtered in Microsoft Excel before being processed using R-Studio 3.2 software. The results of the data collection are presented in the following section.

3.6. Evaluation of the Relationship Between Factors and Respondent Profiles

To assess the relationships between the various factors and the respondents' profiles (gender, age, physical condition, income), the study uses a focused principal component analysis (FPCA) for each of the five factors of perceived walkability. This method makes it possible to define the characteristics of the pedestrian profile that most influence the factors of perceived walkability.

4. Results

4.1. Respondents Profiles

The profile of the people surveyed for this study is diverse. Table 4 below summarizes the profile of those surveyed according to gender, age, income and physical condition.

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Table 4.
Summary of pedestrian profiles.

	Groups	Frequency	Perrcentages (%)
Sex	Male	70	59.83%
	Female	47	40.17%
	Total	117	100.00%
Age	12-18 years	10	8.55%
	19-25 years	28	23.93%
	26-45 years	56	47.86%
	46-60 years	21	17.95%
	61-79 years	2	1.71%
	80 years and more.	0	0.00%
	Total	117	100.00%
Incomes (Francs CFA XOF)	[0 to 52.000]	77	65.81%
	[52.001 to 100.000]	25	21.37%
	[100.001 to 200.000]	9	7.69%
	[200.001 to 300.000]	6	5.13%
	[300.001 and more [	0	0.00%
	Total	117	100.00%
Physical conditions	Nothing to report	94	80.34%
	Pregnant Women	3	2.56 %
	Walking with a toddler,	19	16.24 %
	Crippled / Wheelchair user, etc.	1	0.85%
	Total	117	100.00%

Table 4 shows that the majority of pedestrians are men (59.83%).

Overall, pedestrians have relatively low incomes. All the pedestrians we met earn less than XOF 300,000. The majority of respondents, i.e. 65.81% of pedestrians encountered, earn a salary below the guaranteed minimum wage in the Republic of Benin, which is XOF 52,000.

The most common age group among pedestrians is the 19-45 age group, which accounts for 71.79% of respondents.

In terms of physical conditions, over 80% of respondents claim to have no physical limitations. Only 16% of pedestrians walk with young children. The least represented profiles are pregnant women and people with disabilities. The latter may be related to the lack of facilities for people with reduced mobility.

In the peri-urban areas of Abomey-Calavi, active adults with relatively low incomes are the main users of walking.

4.2. Perception of Walkability in the Peri-Urban Districts of Hêvié, Ouèdo and Togba

The perception of walkability in this study is assessed on the basis of six (06) different factors. Analysis of the data shows that, overall, the population has a poor perception of the walkability of the study area. The highest scoring factors were access (2.24) and connectivity (2.04). These two factors fall into the "moderately positive perceptions" category. Thus, respondents have a moderately positive perception of access and connectivity. The other four factors (Aesthetics/Attractiveness; Comfort; Inclusivity; and Safety) have average scores in the category of]1.5 and 2], corresponding to an "overall unsatisfactory perception". In general, pedestrians in Hêvié, Ouèdo and Togba have an overall unsatisfactory perception of aesthetics, comfort, inclusiveness and safety.

Table 5 summarizes the results obtained by factor.

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Table 5.
Perceived walkability in Hêvié, Ouèdo et Togba: analysis per factors.

Factors	Median	Mean	Standard Deviation
I. Aesthetic /Attractiveness	2	1.98	0.56
II. Access	2	2.24	0.79
III. Comfort	2	1.79	2.00
IV. Connectivity	2	2.04	0.78
V. Inclusivity	2	1.94	0.78
VI. Security	2	1.61	0.52

Note: N.B. : The colors assigned to the factors correspond to the value of the average.]1 – 1,5] = Negative perception ;]1,5 – 2] = Unsatisfied ;]2 – 2,5] = Moderately positive perception ;]2,5 – 3] = Overall Satisfied ;]3 – 3,5] = Highly satisfied ;]3,5 - 4] = Very satisfied.

The results per factor were obtained by collecting data per question. The most important thing to note when reading the data is that none of the questions received a "high satisfaction" or "very high satisfaction" rating. The pedestrian satisfaction scores for each question range from 2.66/4 to 1.26/4. Thus, the level of satisfaction ranges from "very negative opinion" to "generally satisfactory satisfaction".

Pedestrians' perceptions of each of the questions asked are shown in table 06 below.

Table 6.
Perceived Walkability in Hêvié, Ouèdo et Togba : analysis per questions.

Factors / Issues	Median	Mean	Standard Deviation
I. Aesthetic /Attractiveness			
1. There are several interesting things to look at when I walk	2.0	2.16	0.83
2. There are many attractive natural sites	1.0	1.26	0.53
3. Attractive buildings	2.0	2.44	0.87
II. Access			
4. Easy access to stores and businesses on foot	2.0	2.38	0.98
5. There are lots of places I can easily get to on foot	3.0	2.66	0.91
6. It's easy to walk from the minibus or cab stops to my house.	1.0	1.69	0.91
III. Confort			
*7. Do sidewalks provide the comfort you need to get around easily ?	1.0	1.59	0.85
8. There's so much traffic close to the sidewalks that it's unpleasant to walk on them.	2.0	1.90	0.90
*9. Trees to provide shade and public places to sit	1.0	1.45	0.76
*10. Public toilets for relief when you're walking	1.0	1.26	0.61
IV. Connectivity			
11. The distances between junctions are often small	2.0	1.94	0.77
12. There are several ways to get from one place to another	2.0	2.28	0.91
13. Streets have very few cul de sacs (dead ends)	2.0	1.97	0.88
V. Inclusivity*			
*14. Children, pregnant women and the elderly can walk easily in this area.	2.0	1.89	0.81
*15. The tracks allow people with reduced mobility (wheelchairs, the blind, the deaf) to move around easily.	1.0	1.50	0.81
VI. Security			
16. The streets are well lit at night	2.0	1.79	0.87
17. Pedestrians and cyclists can be seen from the houses	2.0	1.77	0.86
18. Crosswalks or markings allow pedestrians to cross easily and safely.	1.0	1.38	0.63
19. Vehicle speeds are generally low (below 40 km/h).	2.0	1.79	0.69
20. Most drivers exceed the legal speed limit in urban areas (50 km/h)	2.0	1.85	0.73
21. There's a lot of crime on the tracks in the neighbourhood	1.0	1.48	0.64
22. Insecurity means I don't often consider walking at night	1.0	1.55	0.79
23. There are gangs in the neighborhood	1.0	1.27	0.60
24. Youth and adult groups causing disturbances in public spaces	1.0	1.30	0.58
25. Sales areas or smoking rooms for drugs, tobacco, cigarettes, etc.	1.0	1.35	0.62

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Note: N.B. :]1 – 1,5] = Negative perception ;]1,5 – 2] = Unsatisfied ;]2 – 2,5] = Moderately positive perception ;]2,5 – 3] = Overall Satisfied ;]3 – 3,5] = Highly satisfied ;]3,5 - 4] = Very satisfied.

Looking at Tables 5 and 6, the standard deviations are far from the recorded averages. This means that the answers obtained from the different respondents are scattered. To gain a better understanding of this diversity of responses and perceptions among the respondents, we set out to examine the characteristics of the respondents' profiles that influence their perception of each factor.

4.3. Explanatory Variables for the Various Factors/Criteria

In this section we try to understand the different variables involved in pedestrians' perceptions of each of these factors. To do this, we use a Focused Principal Component Analysis (FPCA). The explanatory variables examined are gender, age, income and physical condition.

4.3.1. Aesthetic /Attractiveness

Figure 2 below shows the correlations between Factor 1 (f1.b = aesthetics/attractiveness) and the explanatory variables (gender, age, income (rm), and physical condition (cpr)). There was a statistically significant association between aesthetics/attractiveness and gender, with a p-value of 0.004 below the 5% significance level ($p<0.05$). In other words, gender significantly influences perception of aesthetics/attractiveness.

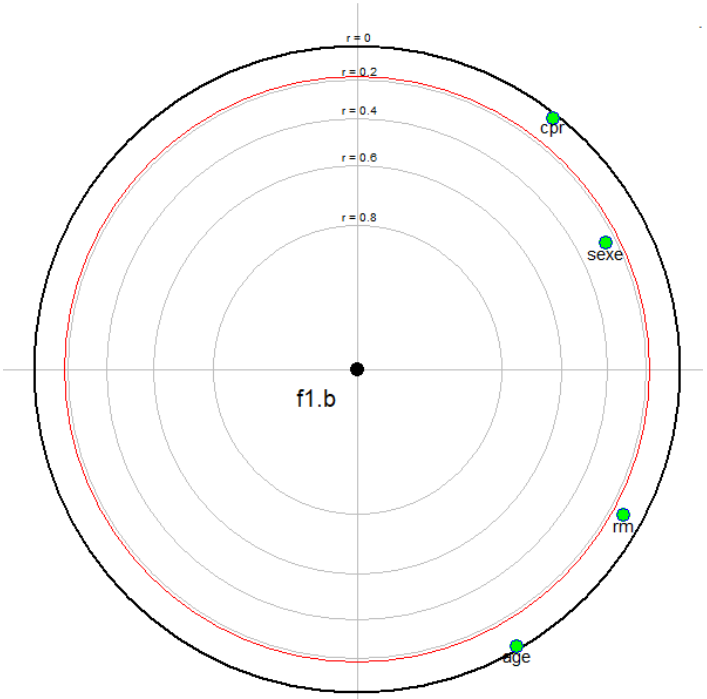

Figure 2.
FPCA results between the "aesthetics/treatment" and the explanatory variables

4.3.2. Accessibility

Figure 3 shows the correlations between the variable to be explained (access) and the explanatory variables (gender, age, income (rm), and physical condition (cpr)). There is a statistically significant association between access and income (rm) at the 5% significance level ($p=0.01 < 0.05$). In other words, income significantly influences the perception of access.

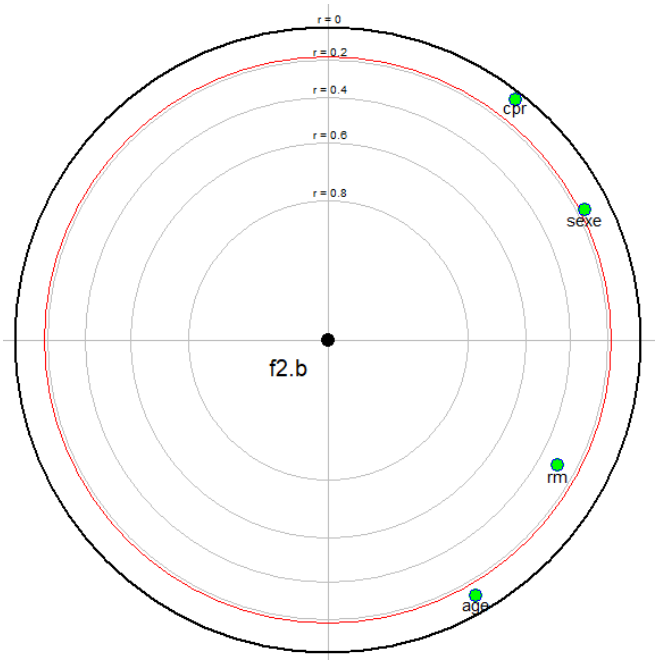

Figure 3.
FPCA results between the "Accessibilty" and the explanatory variables.

4.3.3. Comfort

Figure 4 shows the correlations between the variable to be explained (F3.B = comfort) and the explanatory variables (gender, age, income (rm), and physical condition (cpr)). The present result shows that there is a statistically significant association between comfort, income (rm) and gender at the 5% level of significance ($p < 0.05$). There is also a negative correlation between perceived comfort and physical conditions. In other words, gender and income have a significant effect on perceived comfort.

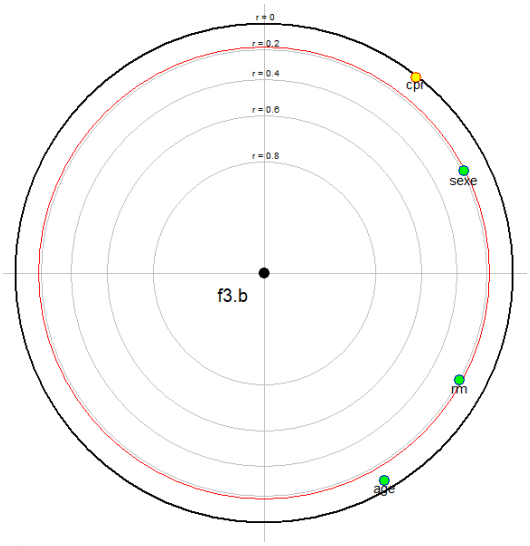

Figure 4.
FPCA results between the variable to be explained "Comfort" and the explanatory variables.

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4.3.4. Connectivity

Figure 5 shows the correlations between the variable to be explained (connectivity) and the explanatory variables (gender, age, income (rm) and physical condition (cpr)). There is a statistically significant relationship between connectivity, income (rm) and gender below the 5% significance level ($p < 0.05$). In other words, gender and income have a significant impact on the perception of connectivity.

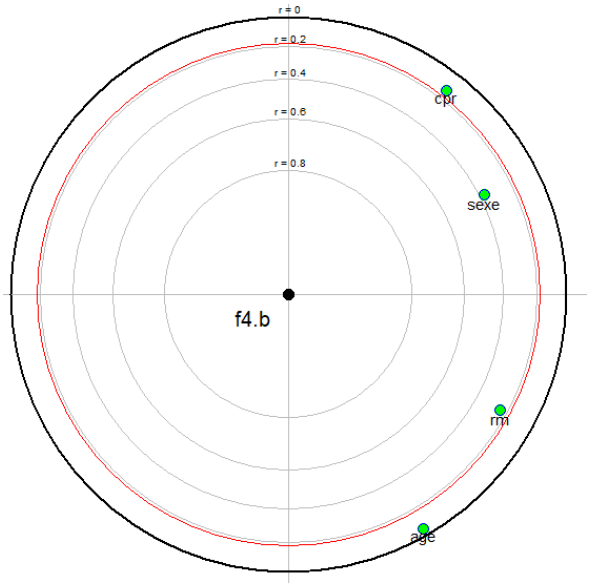

Figure 5.
FPCA results between the variable to be explained "Connectivity" and the explanatory variables

4.3.5. Inclusivity

Figure 6 shows the correlations between the variable to be explained (f5.b = Inclusivity) and the explanatory variables (gender, age, income (rm) and physical condition (cpr)). The explanatory variables are all positively correlated with the variable to be explained "Inclusivity". Nevertheless, there was no statistically significant association between inclusiveness and respondent profile (gender, age, income, physical condition) at the 5% level of significance ($p < 0.05$).

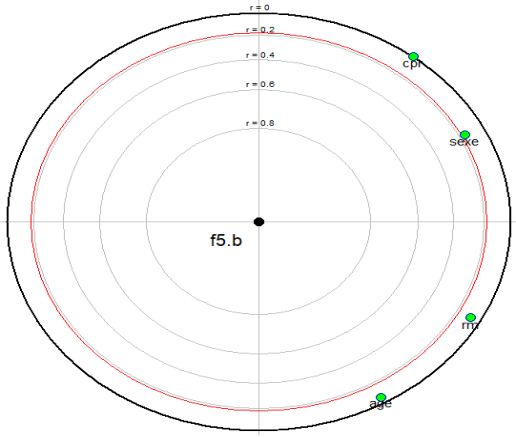

Figure 6.
FPCA results between the variable to be explained "Inclusivity" and the explanatory variables

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4.3.6. Security

Figure 7 below shows the relationships between the variable to be explained (f6.b = safety) and the explanatory variables (gender, age, income (rm) and physical condition (cpr)). There is no statistically significant association between safety and the explanatory variables studied at the 5% significance level ($p < 0.05$). It should be noted that income and age show a negative correlation with the "Inclusiveness" factor. In other words, gender, age, income and physical condition do not significantly influence the perception of safety.

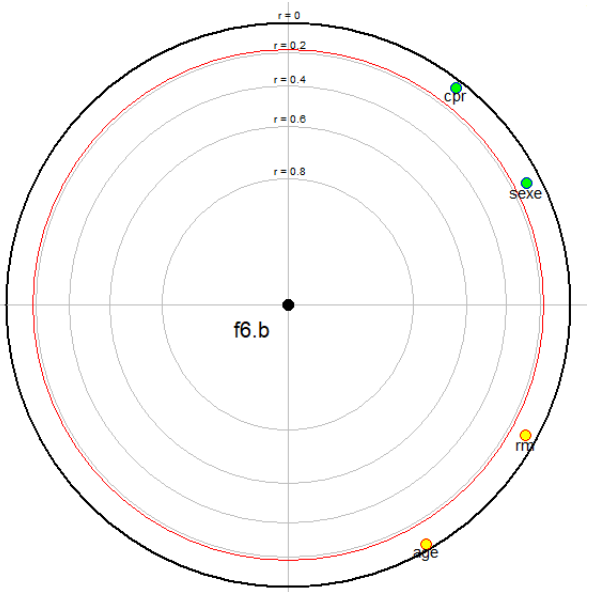

Figure 7.
FPCA results between the variable to be explained "Security" and the explanatory variables

5. Discussion

Six main factors globally influence a person's perception of the potential of walking in their neighborhood. These factors are: 1) Aesthetics/Attractiveness; 2) Access; 3) Comfort; 4) Connectivity; 5) Inclusivity; 6) Safety, as shown in Figure 8.

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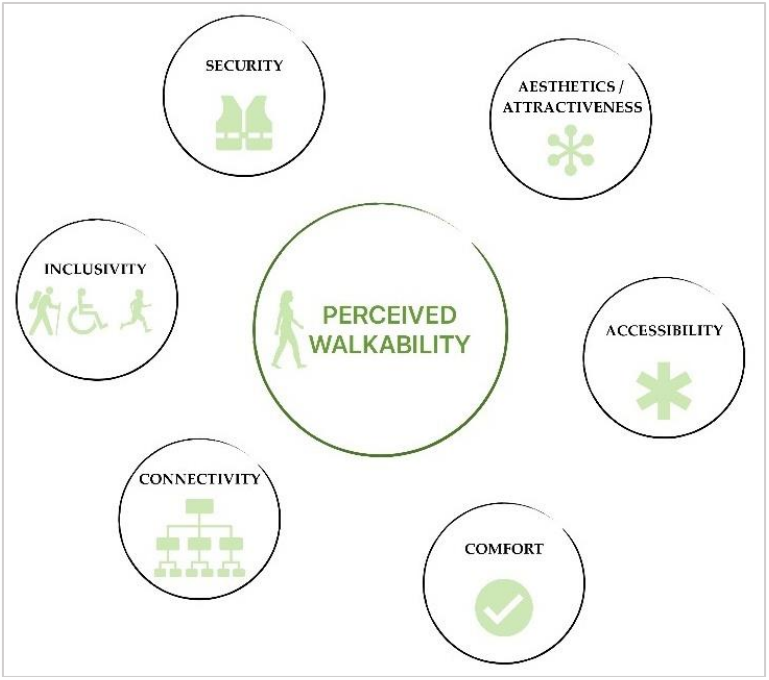

Figure 8.
Factors for assessing Perceived Marketability.

The present proposal of factors influencing the perception of walkability takes into account the factors proposed by Dovey and Pafka [19] in their research "What is Walkability? The urban DMA", which emphasized that the main characteristics of walkability are: attractiveness, functional mix, and accessibility. The results of the present study are also consistent with the factors defined by Jeff Speck in his book "Walkable City: How Downtown Can Save America, One Step at a Time," where he highlights the four fundamental points of the general theory of walkability: utility, safety, comfort, and attractiveness [22]. The results of the UN Habitat and ITDP [23] emphasize comfort, accessibility and safety. It should be noted that several studies refer to other factors such as density, topography, and micro-climate [11, 19]. For the purposes of this study, these elements have been integrated into the "Aesthetics and appeal" factor. Inclusivity is an important issue today, given the exclusion created by the car-city. This study underlines the fact that, when assessing the perception of walkability, it is important to give pride of place to population profiles, considering all groups of people (gender, age, physical condition, income). The work of Speck [35] and National Transport Authority [36] has also led to the same conclusion.

Pedestrians are predominantly male, of working age and with relatively low incomes. Walking is therefore conditioned by gender [37-39] age [40, 41] and incomes [1, 42]. In the specific case of the study area, the elderly and high- and middle-income earners rarely walk. Under these conditions, walking in Hêvié, Ouèdo, and Togba can be considered a constraint, a mode used for lack of access to other modes. Given this hypothesis, we decided to ask respondents an additional question to find out which modes they would prefer if they had a variety of options. The results of this question are shown in Figure 9.

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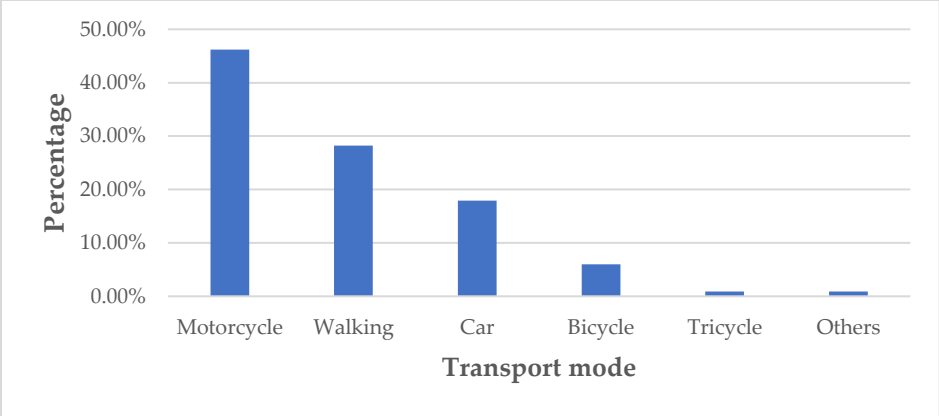

Figure 9.
Mode of transport preferred by respondents if given a choice.

Figure 9 above shows that almost half (46.20%) of pedestrians would choose to use a personal motorcycle if they could afford to buy and maintain one. This contradiction between theoretical choice and practice confirms the hypothesis that walking is currently a default mode for most pedestrians. Therefore, it is necessary to make walking more efficient and attractive to users, regardless of their profile and physical condition.

The least represented profiles in terms of pedestrian fitness are pregnant women and people with disabilities. The latter may be related to the lack of facilities for people with reduced mobility (PRM). The present study shows that sidewalks are either absent, too narrow or crowded (see figures 11, 12, 13, and 14). Several studies on the inclusiveness of streets have shown that the lack of sidewalks makes people with reduced mobility reluctant to use them [41, 43]. In addition, sidewalk surfaces and obstructions (unauthorized installation or parking) play an important role in the safe use of sidewalks by users, especially the disabled [43, 44]. The pavements, the condition of the sidewalks and the signage found in the different streets of our study area (as shown in Figures 1, 2, 3 and 4) do not allow easy movement for pedestrians in general, and even less for people with disabilities in Hêvié, Ouèdo and Togba in Abomey-Calavi (Republic of Benin). This reality is also highlighted by Lee, et al. [45] , who points out that the condition of pavements, pedestrian guidance and green spaces are significant variables in the satisfaction of pedestrians with the practice of walking.

Figures 11, 12, 13, and 14 were selected to represent the different urban landscapes found in the study area. The first image shows the access points to the main artery running through the study area. The second and third images represent the non-dense and dense peri-urban zones, respectively. The fourth image shows the residential area under development in Ouèdo. These different urban landscapes have roads with different profiles, which we thought it necessary to present in order to show the general profile of road profiles in the study area.

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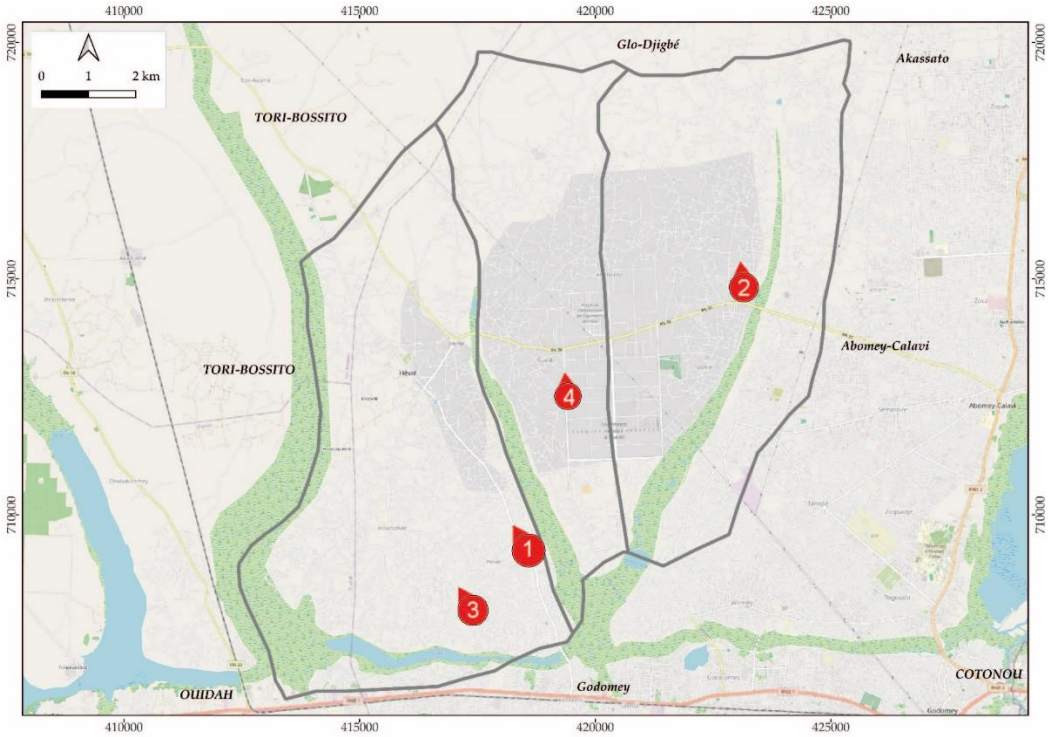

Figure 10.
Location of track profile study photos

Figure 11.
RN30 track profile, Hêvié section

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Figure 12.
Track profile in Togba (sparsely populated peri-urban area)

Figure 13.
Track profile in Hêvié (dense suburban area)

Figure 14.
Ouèdo road profile - Residential area under construction

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Table 7 assesses the various elements of a pedestrian walkway according to the UN Habitat and ITDP [23].

Table 7.
Analysis of track profiles according to the criteria recommended by ITDP and UN-Habitat.

No.	**Figure 11**	**Figure 12**	**Figure 13**	**Figure 14**
Coating	**Asphalt**	**Bare soil**	**Bare soil**	**Asphalt**
Existence of sidewalks	Yes	No	No	Yes
Sidewalk obstructed or not / Pedestrian walkway congested	Yes	_	_	Non
Sufficiently wide footpath/sidewalk (2m minimum)	No	No	No	No
Presence of crosswalks	Yes	No	No	Yes
Well-defined crosswalk / Cleared	No	No	No	Yes
Crosswalks spaced at regular intervals (50-100m)	No	No	No	No
Crosswalk raised above road level (approx. 100 mm)	No	No	No	No
Physical separation between footpath and roadway	No	No	No	Yes
Well-defined parking area	No	No	No	Yes
Space dedicated to vegetation	No	No	No	No
Trees providing shade	No	No	No	No
Do house entrances interrupt pedestrian traffic?	Yes	Yes	Yes	Yes
Street lighting exists and is continuous	No	No	No	Yes
Commercial space with a dedicated area	No	No	No	Yes
Dedicated space for bus stops	No	No	No	No

Given the above table, the different routes found in the study area do not provide an environment conducive to walking, either for people in good physical condition or for those with physical limitations. This observation is consistent with the work of Lee, et al. [45] on pedestrian satisfaction in a medium-sized city in South Korea, which showed that the separation or not of the sidewalk from the road and the availability of sufficient space for pedestrians are factors influencing pedestrian satisfaction with walking. This situation justifies the negative satisfaction expressed by pedestrians in Hêvié, Ouèdo and Togba.

The measurement of perceived walkability is very important, as various studies have shown that individuals with a positive perception of walkability are more inclined to continue walking than those with a high level of objective walkability [46]. In the case of the peri-urban areas of Hêvié, Ouèdo and Togba in the Republic of Benin, pedestrians' overall perception of the potential for walking in their environment was negative. Of the six factors surveyed, only two - access and connectivity - registered moderately positive perceptions. Safety, attractiveness, comfort and inclusiveness are therefore perceived very poorly by pedestrians. According to Peker, et al. [1] environmental perceptions, feelings of safety, and satisfaction with infrastructure play a key role in the choice and continued use of a mode of transport. In the present case of pedestrians' negative perception of the safety of walking, it is essential to rethink the safety of pedestrians in their living environment to ensure the continued use of walking, which is often preferred for short distances, as also highlighted by the work of Harumain, et al. [47]. The relationship between pedestrian profile and perception is also an important subject for analysis.

Table 8 shows the correlations between the various perceived walkability factors and pedestrian profiles.

Table 8.
Correlations between Factors and Pedestrian profile

Factors/ Criteria	Sex	Age	Income	Physical Conditions
Aesthetic /Attractiveness	✖	✖	✖	✖
Accessibility	✖	✖	✖	✖
Comfort	✖	✖	✖	✖
Connectivity	✖	✖	✖	✖
Inclusivity	✖	✖	✖	✖
Security	✖	✖	✖	✖

Note: N.B: ✖ Positive correlation ; ✖ Negative correlation ; ✖ Significance of risk correlations 5%

The present study shows that perception of aesthetics has a significant positive correlation with respondent gender. Pedestrian income is significantly correlated with perceived access, perceived comfort and perceived connectivity. At the same time, the work of Toker [48] suggests a close relationship between walking and socio-economic status.

6. Limits of The Study

This study has some limitations. The main limitation relates to the sample size. We could indeed have reduced the risk of error by increasing the number of respondents, but due to financial and time constraints, we had to limit the number of respondents. This could have had an impact on the representativeness of the sample. The random selection of respondents in the field forced us to select people who were willing to answer our questions, which may have had an impact on the structure of the respondents. We noted, for example, that men were more willing to answer the questions than women (74% of refusals). This study did not take into account pedestrians' reasons for travelling.

7. Conclusion

The way public space is used varies from one city to another and between different parts of the same city. Peri-urban areas present certain peculiarities in the use of public space. This specificity of public space use leads to different perceptions of services. The present study examines the perceptions of pedestrians in Hêvié, Ouèdo and Togba in Abomey-Calavi, Republic of Benin, concerning the walking potential of their living environment. Perceived walkability is assessed through six different factors: aesthetics/attractiveness, access, comfort, connectivity, inclusiveness, and safety. The research shows that the inhabitants of the peri-urban space in the Republic of Benin have an overall negative perception of walkability and practice walking mainly out of compulsion. This situation is partly linked to the road layout, which often lacks comfort and ease of movement for pedestrians. Given this situation, pedestrians say they would choose motorized modes such as motorcycles as their primary mode of transportation if given the choice. Perceptions of the potential of walking vary by respondent profile, income and gender. Looking at the pedestrian profile, we see that income is significantly correlated with perceived accessibility, comfort and connectivity. Income therefore has a significant impact on the overall perception of walkability.

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Transparency:
The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

Authors Contributions:
Conceptualization, Methodology, Formal analysis, Writing—original draft, C.J.M.K.; Writing—review and editing, validation, visualization, I.D., A.K.; supervision, project administration, B.S.A. All authors have read and agreed to the published version of the manuscript.

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References

[1] R. Peker, M. S. Yardim, and K. B. Akalin, "Factors influencing transportation mode preferences for educational trips among dormitory resident university students in Kütahya, Türkiye," *Sustainability*, vol. 16, no. 22, p. 9660, 2024. https://doi.org/10.3390/su16229660

[2] C. J. M. Kadja, I. Dandonougbo, A. Korem, B. S. Allagbe, and F. D. Mensah, "Analysis of access to amenities in peri-urban areas in West Africa: A GIS-based approach in Abomey-Calavi, Republic of Benin," *Journal of Infrastructure, Policy and Development*, vol. 8, no. 13, p. 9266, 2024. https://doi.org/10.24294/jipd9266

[3] C. Matara, S. Osano, A. Yusuf, and E. Akech, "'An assessment of the contribution of vehicular traffic to ambient air quality—A case study of nairobi expressway corridor," *Civil and Environmental Engineering*, vol. 20, no. 1, pp. 54-67, 2024. https://doi.org/10.2478/cee-2024-0005

[4] D. Kumalasari, M. Koeva, F. Vahdatikhaki, D. Petrova Antonova, and M. Kuffer, "Planning walkable cities: Generative design approach towards digital twin implementation," *Remote Sensing*, vol. 15, no. 4, p. 1088, 2023. https://doi.org/10.3390/rs15041088

[5] D. Jo and H. Kim, "Evaluating walkability across age groups and flooring materials using IMU sensors," *Frontiers in Public Health*, vol. 12, p. 1509602, 2024. https://doi.org/10.3389/fpubh.2024.1509602

[6] D. Gu, K. Andreev, and M. E. Dupre, "Major trends in population growth around the world," *China CDC Weekly*, vol. 3, no. 28, p. 604, 2021. https://doi.org/10.46234/ccdcw2021.160

[7] A. J. Bokolo, "Inclusive and safe mobility needs of senior citizens: Implications for age-friendly cities and communities," *Urban Science*, vol. 7, no. 4, p. 103, 2023. https://doi.org/10.3390/urbansci7040103

[8] United Nations Environment Programme, *Emissions gap Report 2024: No more hot air … please! With a massive gap between rhetoric and reality, countries draft new climate commitments*. United Nations Environment Programme. https://doi.org/10.59117/20.500.11822/46404, 2024.

[9] S. Guendehou, J. Agbo, and J. Kouazounde, "First updated biennial report of Benin. Ministry of living environment and sustainable development, Cotonou-Benin," Retrieved: https://unfccc.int/sites/default/files/resource/BENIN_BUR1_2019.pdf. [Accessed 2019.

[10] N. Picarelli and R. M. Da Silva, *National report on climate and development - Benin*. Washington, DC 20433, USA: World Bank Group, 1818 H Street NW, 2023.

[11] E. Pafka and K. Dovey, "Permeability and interface catchment: measuring and mapping walkable access," *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, vol. 10, no. 2, pp. 150-162, 2017. https://doi.org/10.1080/17549175.2016.1220413

[12] K. M. Abdulla, M. G. Abdelmonem, and G. Selim, "Walkability in historic urban spaces: Testing the safety and security in Martyrs' Square in Tripoli," *International Journal of Architectural Research: ArchNet-IJAR*, vol. 11, no. 3, pp. 163-177, 2017. https://doi.org/10.26687/archnet-ijar.v11i3.1378

[13] J. Blackwood, R. Suzuki, and H. Karczewski, "Perceived neighborhood walkability is associated with recent falls in urban dwelling older adults," *Journal of Geriatric Physical Therapy*, vol. 45, no. 1, pp. E8-E15, 2022. https://doi.org/10.1519/JPT.0000000000000300

[14] N. Otsuka, D. Wittowsky, M. Damerau, and C. Gerten, "Walkability assessment for urban areas around railway stations along the Rhine-Alpine Corridor," *Journal of Transport Geography*, vol. 93, p. 103081, 2021. https://doi.org/10.1016/j.jtrangeo.2021.103081

[15] E. Vafeiadis and E. Elldér, "Correlates of perceived accessibility across transport modes and trip purposes: Insights from a Swedish survey," *Transportation Research Part A: Policy and Practice*, vol. 186, p. 104147, 2024. https://doi.org/10.1016/j.tra.2024.104147

[16] A. Baobeid, M. Koç, and S. G. Al-Ghamdi, "Walkability and its relationships with health, sustainability, and livability: elements of physical environment and evaluation frameworks," *Frontiers in Built Environment*, vol. 7, p. 721218, 2021. https://doi.org/10.3389/fbuil.2021.721218

[17] H. M. Al-Hazzaa *et al.*, "Arabic translation, cultural adaptation, and pre-testing of neighborhood environment walkability scale for adults-abbreviated (NEWS-A): Arabic NEWS-A," *Frontiers in Built Environment*, vol. 10, p. 1426705, 2024. https://doi.org/10.3389/fbuil.2024.1426705

[18] M. Knapskog, O. H. Hagen, A. Tennøy, and M. K. Rynning, "Exploring ways of measuring walkability," *Transportation Research Procedia*, vol. 41, pp. 264-282, 2019. https://doi.org/10.1016/j.trpro.2019.09.047

[19] K. Dovey and E. Pafka, "What is walkability? The urban DMA," *Urban studies*, vol. 57, no. 1, pp. 93-108, 2020. https://doi.org/10.1177/0042098018819727

[20] A. Consoli, A. Nettel-Aguirre, J. C. Spence, T.-L. McHugh, K. Mummery, and G. R. McCormack, "Associations between objectively-measured and self-reported neighbourhood walkability on adherence and steps during an internet-delivered pedometer intervention," *Plos one*, vol. 15, no. 12, p. e0242999, 2020. https://doi.org/10.1371/journal.pone.0242999

[21] J. De Vos, K. Lättman, A.-L. Van der Vlugt, J. Welsch, and N. Otsuka, "Determinants and effects of perceived walkability: A literature review, conceptual model and research agenda," *Transport Reviews*, vol. 43, no. 2, pp. 303-324, 2023. https://doi.org/10.1080/01441647.2022.2101072

[22] O. Marquet, "Speck, Jeff (2012). Walkable City: How downtown can save america, one step at a time," *Documents d'Anàlisi Geogràfica*, vol. 61, no. 2, pp. 436-437, 2015. https://doi.org/10.5565/rev/dag.274

[23] UN Habitat and ITDP, "Streets for walking and cycling. UN Habitat," Retrieved: https://www.itdp.org/wp-content/uploads/2018/07/Streets-for-walking-and-cycling.pdf. [Accessed Oct. 23, 2024], 2018.

[24] H. Wang and Y. Yang, "Neighbourhood walkability: A review and bibliometric analysis," *Cities*, vol. 93, pp. 43-61, 2019. https://doi.org/10.1016/j.cities.2019.04.015

[25] D. Ki, Z. Chen, S. Lee, and S. Lieu, "A novel walkability index using google street view and deep learning," *Sustainable Cities and Society*, vol. 99, p. 104896, 2023. https://doi.org/10.1016/j.scs.2023.104896

[26] S. Porta and J. L. Renne, "Linking urban design to sustainability: formal indicators of social urban sustainability field research in Perth, Western Australia," *Urban Design International*, vol. 10, pp. 51-64, 2005. https://doi.org/10.1057/palgrave.udi.9000136

[27] A.-L. Van Der Vlugt, A. Curl, and J. Scheiner, "The influence of travel attitudes on perceived walking accessibility and walking behaviour," *Travel Behaviour and Society*, vol. 27, pp. 47-56, 2022. https://doi.org/10.1016/j.tbs.2021.11.002

[28] Y. Suarez-Balcazar, A. R. Early, C. Garcia, D. Balcazar, D. L. Arias, and M. Morales, "Walkability safety and walkability participation: A health concern," *Health Education & Behavior*, vol. 47, no. 3, pp. 430-438, 2020. https://doi.org/10.1177/1090198120903256

[29] W. A. Jensen, B. B. Brown, K. R. Smith, S. C. Brewer, J. W. Amburgey, and B. McIff, "Active transportation on a complete street: Perceived and audited walkability correlates," *International Journal of Environmental Research and Public Health*, vol. 14, no. 9, p. 1014, 2017. https://doi.org/10.3390/ijerph14091014

[30] C. K. Lui and T. W. Wong, "Associations among perceived walkability of neighborhood environment, walking time, and functional mobility by older adults: An exploratory investigation," *Ageing International*, pp. 1-14, 2022. https://doi.org/10.1007/s12126-021-09449-3

[31] E. Hinckson *et al.*, "Associations of the perceived and objective neighborhood environment with physical activity and sedentary time in New Zealand adolescents," *International Journal of Behavioral Nutrition and Physical Activity*, vol. 14, pp. 1-15, 2017. https://doi.org/10.1186/s12966-017-0597-5

[32] P. Morales-Flores and C. Marmolejo-Duarte, "Can we build walkable environments to support social capital? Towards a spatial understanding of social capital; a scoping review," *Sustainability*, vol. 13, no. 23, p. 13259, 2021. https://doi.org/10.3390/su132313259

[33] T. V. Calise, W. Chow, A. Ryder, and C. Wingerter, "Food access and its relationship to perceived walkability, safety, and social cohesion," *Health Promotion Practice*, vol. 20, no. 6, pp. 858-867, 2019. https://doi.org/10.1177/1524839918778553

[34] A. Adkins, G. Barillas-Longoria, D. N. Martínez, and M. Ingram, "Differences in social and physical dimensions of perceived walkability in Mexican American and non-hispanic white walking environments in Tucson, Arizona," *Journal of Transport & health*, vol. 14, p. 100585, 2019. https://doi.org/10.1016/j.jth.2019.100585

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 3: 2109-2130, 2025
DOI: 10.55214/25768484.v9i3.5752

[35] J. Speck, *Walkable City rules: 101 steps to making better places*. Washington, D.C, Covelo; London: Island Press, 2018.
[36] National Transport Authority, "Universal design walkability audit tool for road and streets. National transport authority," Retrieved: http://www.nationaltransport.ie/news/the-universal-design-walkability-audit-tool/. [Accessed Oct. 15, 2024], 2021.
[37] R. Goel, O. Oyebode, L. Foley, L. Tatah, C. Millett, and J. Woodcock, "Gender differences in active travel in major cities across the world," *Transportation*, pp. 1-17, 2022. https://doi.org/10.1007/s11116-021-10259-4
[38] W. Gong, X. Huang, M. White, and N. Langenheim, "Walkability perceptions and gender differences in urban fringe new towns: A case study of Shanghai," *Land*, vol. 12, no. 7, p. 1339, 2023. https://doi.org/10.3390/land12071339
[39] G. Porter *et al.*, "Women's mobility and transport in the peripheries of three African cities: Reflecting on early impacts of COVID-19," *Transport Policy*, vol. 110, pp. 181-190, 2021. https://doi.org/10.1016/j.tranpol.2021.05.025
[40] P. Najafi and M. Mohammadi, "Redefining age-friendly neighbourhoods: Translating the promises of Blue Zones for contemporary urban environments," *International Journal of Environmental Research and Public Health*, vol. 21, no. 3, p. 365, 2024. https://doi.org/10.3390/ijerph21030365
[41] X. Huang, M. White, and N. Langenheim, "Towards an inclusive walking community—a multi-criteria digital evaluation approach to facilitate accessible journeys," *Buildings*, vol. 12, no. 8, p. 1191, 2022. https://doi.org/10.3390/buildings12081191
[42] A. S. Walia, A. C. King, M. I. Campero, D. M. Garcia, R. E. Lee, and A. N. Zamora, "Exploring the relationship between built environment attributes and physical activity in lower-income aging adults: Preliminary insights from a multi-level trial," *International Journal of Environmental Research and Public Health*, vol. 21, no. 5, p. 607, 2024. https://doi.org/10.3390/ijerph21050607
[43] H. P. Adi, R. Heikoop, and S. I. Wahyudi, "Enhancing inclusivity: Designing disability friendly pedestrian pathways," *International Journal of Safety & Security Engineering*, vol. 14, no. 3, pp. 691–699, 2024. https://doi.org/10.18280/ijsse.140303
[44] F. Harris, H.-Y. Yang, and J. Sanford, "Physical environmental barriers to community mobility in older and younger wheelchair users," *Topics in Geriatric Rehabilitation*, vol. 31, no. 1, pp. 42-51, 2015. https://doi.org/10.1097/TGR.0000000000000043
[45] S. Lee, M. Han, K. Rhee, and B. Bae, "Identification of factors affecting pedestrian satisfaction toward land use and street type," *Sustainability*, vol. 13, no. 19, p. 10725, 2021. https://doi.org/10.3390/su131910725
[46] J. Orrego-Oñate and O. Marquet, "The role of perceived and objective accessibility in shaping walking behavior: Insights from mid-sized Spanish cities," *Transportation Research Part A: Policy and Practice*, vol. 192, p. 104340, 2025. https://doi.org/10.1016/j.tra.2024.104340
[47] Y. A. S. Harumain, S. Koting, N. A. Rosni, and N. Ibrahim, "The influence of sociodemographic background on active transportation: A case study of bangsar and Shah Alam, Malaysia," *Frontiers in Built Environment*, vol. 8, p. 925956, 2022. https://doi.org/10.3389/fbuil.2022.925956
[48] Z. Toker, "Walking beyond the Socioeconomic Status in an objectively and perceptually walkable pedestrian environment," *Urban Studies Research*, vol. 2015, no. 1, p. 919874, 2015. https://doi.org/10.1155/2015/919874

Appendix A.

Survey_ Neighbourhood Environment Walkability Scale - Abbreviated (NEWS-A) model adapted to our study.

Factors / Issues	**Bad**	**More or Less Acceptable**	**Good**	**Very Good**
Note	1	2	3	4
I. Aesthetic /Attractiveness				
1. There are several interesting things to look at when I walk				
2. There are many attractive natural sites				
3. Attractive buildings				
II. Access				
4. Easy access to stores and businesses on foot				
5. There are lots of places I can easily get to on foot				
6. It's easy to walk from the minibus or cab stops to my house.				
III. Confort				
*7. Do sidewalks provide the comfort you need to get around easily ?				
8. There's so much traffic close to the sidewalks that it's unpleasant to walk on them.				
*9. Trees to provide shade and public places to sit				
*10. Public toilets for relief when you're walking				

IV. Connectivity				
11. The distances between junctions are often small				
12. There are several ways to get from one place to another				
13. Streets have very few cul de sacs (dead ends)				
V. Inclusivity*				
*14. Children, pregnant women and the elderly can walk easily in this area.				
*15. The tracks allow people with reduced mobility (wheelchairs, the blind, the deaf) to move around easily.				
VI. Security				
16. The streets are well lit at night				
17. Pedestrians and cyclists can be seen from the houses				
18. Crosswalks or markings allow pedestrians to cross easily and safely.				
19. Vehicle speeds are generally low (below 40 km/h).				
20. Most drivers exceed the legal speed limit in urban areas (50 km/h)				
21. There's a lot of crime on the tracks in the neighbourhood				
22. Insecurity means I don't often consider walking at night				
23. There are gangs in the neighborhood				
24. Youth and adult groups causing disturbances in public spaces				
25. Sales areas or smoking rooms for drugs, tobacco, cigarettes, etc.				
*OTHER QUESTIONS				
*Sex - Homme - Femme - No answer				
*Income (XOF fcfa) : - [0 à 52.000], - [52.001 à 100.000], - [100.001 à 200.000], - [200.001 à 300.000] - [300.001 and more [				
*Age : - 12-18 years ; - 19-25 years, - 26-45 years, - 46-60 years, - 61-79 years, - 80 and more.				
*Physical conditions : - Pregnant, - Wlaking with a child, - With wheelchair or cripple - Other				

N.B. *: * Questions different from those of* Jensen, et al. [29] *; Possible answers to questions: (1) Poor; (2) More or less acceptable; (3) Good; (4) Very good.*

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