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Levels and Characteristics of Utilitarian Walking in the Central Areas of the Cities of Bologna and Porto

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Abstract: Walking is a mode of transport that offers many environmental and health benefits. Utilitarian walking refers to walking trips undertaken to fulfil routine purposes. The aim of this paper is to examine the extent to which walking is used as a transport mode for short urban trips in the city centers of Bologna and Porto and the barriers preventing utilitarian walking. Based on a questionnaire ($n = 1117$) administered in the two cities, results indicated that 21% of the individuals travel by foot, while 47% combine walking with other modes. This means that 68% of the daily trips to these city centers involve walking activity. From the overall trips, 84% were made to reach work and school/university. Statistical tests showed that utilitarian walkers were more likely to be females ($p < 0.001$) and undergraduates ($p < 0.001$). People from Bologna were more likely to engage in utilitarian walking than people from Porto ($p < 0.001$). Travel distance and time were the main barriers preventing people from engaging in utilitarian walking. The findings described in this paper provide a better understanding of utilitarian walking in the central areas of both cities, which can guide policies to promote healthier lifestyles and sustainable mobility.

Keywords: utilitarian walking; active mobility; active transport; sustainable mobility; pedestrians

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1. Introduction

Walking is the oldest and simplest form of human mobility. Everyone is a pedestrian, and walking is usually the first and last mode used in a trip. Walking is often considered the greenest, cheapest, and easiest mode of transport [1–3]. Walking reduces the negative environmental impacts caused by motorized traffic in terms of CO_2, air pollutants, and noise [4]. For that reason, replacing short car trips with walking trips has an important role in making our cities more sustainable [5]. Walking is also an active mode of transport and the most widely available form of physical activity that helps to prevent various physiological and mental diseases associated with sedentary lifestyles, such as obesity, diabetes, and depression [6]. The World Health Organization (WHO) recommends daily bouts of physical activity of about 10 min to result in positive health outcomes [7]. Thus, daily walking to routine destinations can help to achieve this target defined by the WHO. Walking is also the most socially inclusive mode of transport: it is free, promotes social interaction, and does not require special equipment [1,8].

For these benefits, extensive research has been carried out to understand the attributes that are conducive to walking and how to create more walkable cities. The extent to which the built environment is pedestrian-friendly and enables walking is broadly defined as "walkability" [9]. Walkability is often a composite index of a changeable number of built environment attributes showing how walkable an area is [9,10]. Land-use mix, population density, street connectivity, and distance to destinations are built environment attributes that have been positively correlated with walking [11–13].

There are two basic categories of walking: recreational walking and utilitarian walking. While recreational walking is done purposefully as exercise, utilitarian walking is undertaken to fulfil routine purposes and tasks [14,15]. Utilitarian walking often refers to active transport or to walking as a means of transport for rather short trips [16]. Short trips are differently understood, but have been classified as trips under 5 km in length [17]. Under the concepts of 10-min walk [14] and 15-min walkable neighborhoods [18], walking is a mode generally suited for travelling distances ranging from about 0.8 to 1.5 km. For greater distances, walking can be combined with public transport, but cycling is also a suitable alternative for short trips up to 5 km [18].

The extent to which people use the pedestrian mode to reach routine destinations is difficult to assess, as the national travel surveys often do not include short trips. Additionally, the walking parts of trips made primarily by public transport are usually not taken into account. Therefore, the importance of walking is underestimated in many regions, including in the European Union [19]. In addition, the decision to walk and the perception of walkability depend on various interconnected reasons involving built environment and individual variables. Thus, exploring the extent to which people are engaged in utilitarian walking and the determinants affecting their behavior may help transportation researchers and planners in defining more effective actions to promote walkability and the pedestrian mobility.

In order to provide a better understanding of utilitarian walking, this paper examines the extent to which walking is daily used as a transport mode for short urban trips. Based on a questionnaire (n = 1117) administered in the cities of Bologna (Italy) and Porto (Portugal), this paper analyzes five main issues: (i) the extent to which walking is used as a transport mode for short urban trips in these cities; (ii) the purposes of utilitarian walking in these cities, namely by considering the following destinations: walking to work, school/university, public transport, shops, car parks and accessing services; (iii) the time spent walking, which could give some insights into how active the population is; (iv) the barriers preventing people to engage in utilitarian walking; and (v) the actions needed to engage non-walkers in utilitarian walking in the future. The questionnaire was conducted within the context of the Smart Pedestrian Net research project, which aimed at creating more walkable cities and fostering the use of pedestrian mode in urban trips. The analysis was complemented with a statistical analysis. Chi-square tests were performed to identify relationships between individual and geographic variables and utilitarian walking, while a regression analysis was carried out to examine the relationship between the frequency and the determinants of walking.

To the best of the authors' knowledge, this is the first study examining utilitarian walking in these cities, thus gaining insights into travel behavior and the influence of individual variables on walking. This information could be helpful for supporting measures to further promote walking as a more sustainable and healthier means of transport in our cities.

This paper is organized as follows. The next section presents a literature review focused on key aspects linked to utilitarian walking. Then, Section 3 describes the material and methods adopted in this study. The results are presented in Section 4 and discussed in Section 5. Finally, the last section summarizes the main conclusions of this study.

2. Literature Review

The literature review aims at presenting the main categories of walking and the factors with influence on utilitarian walking. Thus, this section is organized as follows: (i) categories of walking; (ii) influence of built environment attributes on utilitarian walking; and (iii) influence of individual variables on utilitarian walking.

2.1. Categories of Walking

People walk for different reasons and purposes. There are two basic categories of walking: recreational walking and utilitarian walking. Recreational walking is undertaken as a leisure activity without any specific purpose or destination, such as walking around a neighborhood or in a park [8]. In turn, utilitarian walking refers to walking trips undertaken to fulfil routine purposes and tasks [14,15]. The most relevant determinants of utilitarian walking are walking to work, school/university, shops, and public transport. Walking to work and to school/university usually constitute the highest share of daily trips in urban areas [20]. Walking to shops is also a very common travel purpose, and the presence of facilities such as grocery stores, supermarkets, restaurants, banks, and fitness centers, among others, has a great impact on inducing utilitarian walking [21–25]. Walking to public transport is a common determinant too, as the use of public transport generally involves walking to bus stops and train stations [26,27]. For that reason, public transport has been considered as active travel, because the distance travelled from the stop to the destination can make a significant contribution to daily physical activity and healthy lifestyles [28].

For their different nature and purposes, utilitarian and recreational walking are substantially different in terms of frequency, speed, duration, and related built environment attributes [29,30]. Inversely to recreational walking, utilitarian walking involves mandatory and fixed activities, controlled by relatively rigid schedules [23]. For that reason, utilitarian walking generally involves shorter and faster trips than recreational walking [14,21,31]. For example, the studies conducted by Kang et al. [14] and by Millward et al. [21] showed that utilitarian walking was, respectively, 9% to 12% faster than recreational walking. In turn, the research of Bunds et al. [32] on recreational walking demonstrated that walking distance and time were only the fifth rated most important attribute, after various health-promoting aspects of the environment. Moreover, the purpose of the utilitarian trip also has impact on aspects such as walking time. For example, Yang and Diez-Roux [33] reported that people walk less to shops than to work due to the burden of carrying their purchases. Daniels and Mulley [34] also found that walking trips for education and shopping/personal business are significantly shorter than walking trips for work.

2.2. Influence of Built Environment Attributes on Utilitarian Walking

It has also been shown that utilitarian and recreational walking are differently influenced by built environment attributes. Utilitarian walking trips, resulting from specific needs, could be less responsive to environmental quality than recreational walking, which is more sensitive to a satisfactory pedestrian environment [35]. More particularly, utilitarian walking tends to occur in denser urban environments [15,36], characterized by high residential and public transport densities, land use mix, street connectivity, and local amenities [24,36–38]. Areas with high residential and amenity densities are more conducive to walking. They are not only attractive for retail and services, but also for walking, as they reduce the distance and time of travel between residences and destinations [39]. For that reason, areas characterized by mixed land uses providing non-residential activities, such as shops, restaurants, offices, and banks, among others, have been correlated to pedestrian-friendly environments and walking [10,40]. For instance, in the specific case of walking to shops, Scheepers et al. [41] concluded that compact urban centers were the most conducive urban spaces for this type of walking, due to the short distances and mixed land-uses found there. In turn, areas with high public transport densities are also attractive for walking, meaning that stops are near enough to be reached by walking. It is recognized that the shorter the distance to a stop, the higher the walking activity and the greater the odds are of walking to public transport [42]. Street connectivity is also a well-known determinant of walking, representing the directness and availability of alternative routes between destinations [43]. More interconnected streets provide more potential routes for walking and shorter distances to destinations. For that reason, street connectivity has been associated with walking [10,44]. The characteristics and condition of the pedestrian infrastructure are another variable with influence on walking [45]. The pedestrian infrastructure determines the physical conditions provided to pedestrians, showing how safe, attractive, and convenient the routes can be. This includes attributes such as traffic safety, security, and slopes. High traffic volume and speed, high perceived crime, and high slopes often prevent people from walking and work as a barrier to walking [46–48].

Travel distance is, therefore, critical for pedestrians, mainly for those engaged in utilitarian walking. On the one hand, walking is a low speed mode of transport and requires more physical effort to reach distant destinations. On the other hand, people are constrained by busy agendas and fixed time schedules, being less available to engage in long walking trips. Some authors showed that as the travelling distance increases, the probability of using motorized transport also increases [49]. Independently of the purpose of walking, people are less likely to walk when distances are greater that a certain threshold. For example, in the case of walking to university, Zhan et al. [50] found that 87% of the students of eight Chinese universities choose to walk when the travel distance is <1 km, but when the distance is greater, they choose other modes. An identical conclusion was found by Ribeiro et al. [51] in Portugal: living near the campus was the main reason for walking to the university. Therefore, as utilitarian walking is generally adopted for traveling short distances, it is important to plan and design our cities more efficiently for pedestrians by connecting trip origins and destinations with safe and comfortable infrastructure, namely in areas with higher building density and greater mix of land uses.

2.3. Influence of Individual Variables on Utilitarian Walking

Individual aspects, such as gender, age, and income, have also been reported as having influenced pedestrian behavior and preferences. For instance, Hatamzadeh et al. [52] found that the negative effect of walking distance was greater for females on working trips, but was greater among males in the case of shopping trips. In turn, females tend to be more cautious about the safety and security risks associated with walking than males [53,54]. Elderly pedestrians and seniors may have more time and flexibility to walk, but due to aging, they not only lose some skills, such as less walking speed, stable balance and wayfinding capabilities, but also have more unsafe crossing behaviors [2,5]. However, findings of the impact of age on walking are not consensual. While Ghani et al. [55] found that elderly pedestrians are less likely to walk for utilitarian purposes, Hatamzadeh et al. [52] reported that seniors were more likely to walk to work and to shops relative to the younger population. Nonetheless, the geographic context seems to play an important role in the predisposition of elderly pedestrians to walk. The study of Hallal et al. [56] indicated that adults aged 60 years or older from southeast Asia were much more active than individuals from the same age from all other regions and were more active than young adults from the Americas, Europe, and the Western Pacific. This was also confirmed by Park et al. [57] in a study conducted in Seoul and Seattle. They found that the participants in Seoul walk much more on average per day (2.6 km) than those in Seattle (0.4 km). In addition, participants in Seoul were more engaged in utilitarian walking (70%) than in Seattle (50%). Regarding income, people with higher incomes tend to be less available to use active modes [27,58], and there is evidence that physical inactivity is more common in countries of high income [56]. Other variables, such as the weather and the day of the week, also have a considerable influence on the decision to walk. Adverse weather conditions are a strong barrier to walking [51,53] and cause strong seasonal variations in walking [59]. The day of the week may also affect the decision to walk. During weekdays, people engaged in utilitarian walking are more sensitive to travel time due to busy agendas and fixed time schedules than they are during weekends [36]. Thus, individual variables result in different perceptions of space and travel behaviors, which have a strong impact in the decision to walk.

3. Materials and Methods

This study analyzes the extent to which utilitarian walking is used as a transport mode in the cities of Bologna (Italy) and Porto (Portugal). This study was conducted in the context of the research project Smart Pedestrian Net (SPN), which aims at promoting walkability as one of the important dimensions of smart, sustainable, and inclusive cities. The central areas of Bologna and Porto were used as pilot areas for developing and applying the project because, as explained above, utilitarian walking tends to occur in denser urban environments.

3.1. Study Areas

Bologna and Porto are located in Northern Italy and Portugal, respectively. Both cities share some common features in terms of cultural background. Both were walled cities and are recognized for their rich history and culture. Bologna is particularly famous for its monuments and extensive porticoes and arcades that cover most of the city center, while the historic center of Porto is classified as a World Heritage Site. Therefore, the two cities are visited by thousands of tourists every year. The two cities are also regional capitals, and therefore host important businesses and companies, as well as higher education institutions. However, they have diverse pedestrian environments, morphologies and streetscape design, which result in different conditions provided to pedestrians. The wide range of conditions makes it interesting to analyze the extent to which people are engaged in utilitarian walking in both city centers.

As shown in Table 1, with 375,935 inhabitants, Bologna has more population than Porto, but has a lower density. As illustrated in Table 1 and Figure 1, Bologna has a large urban boundary, while Porto is much smaller and compact. The central areas considered in this study are also shown in Figure 1. In the case of Bologna, the city center corresponds to the core delimited by the city walls of the 13th century; in the case of Porto, we adopted the boundary previously used by Jabbari et al. [60], which includes the historic center classified by UNESCO and the adjacent urban spaces. Both urban centers had public transport infrastructure, street connectivity, and building densities higher than the surrounding urban areas, but lower percentages of residential buildings (Table 1). In terms of modal split, data from the Census of 2011 show that the car was the most used mode of transport in these cities. In Porto, car trips represented 57% of the modal share.

Table 1. Built environment variables and modal split in Bologna and Porto.

Variables	Bologna		Porto	
	City	Center	City	Center
Area and population (2011)				
Urban boundary (km^2)	140.8	4.51	41.4	2.60
Total inhabitants	375,935	26,108	237,591	14,527
Population density (inh./km^2)	2669.9	5788.9	5738.9	5587.3
Buildings (2011)				
Total of buildings	35,356	5441	44,324	4043
Building density (N°/km^2)	251.1	1206.4	1070.6	1555.0
Residential buildings (%)	79.3	74.4	85.7	58.7

Transport infrastructure				
Street density (km/km^2)	7.23	20.29	16.3	20.28
Intersection density (N°/km^2)	103.3	569.0	256.6	516.5
P.Trans. stop density (N°/km^2)	9.6	40.8	23.2	38.85
Cycling lanes (km)	160.1	45.0	22.1	0
Modal split (2011)				
Car	46.3%	NA	56.6%	NA
Motorbike	4.1%	NA	0.5%	NA
Public transport	21.0%	NA	25.6%	NA
Walking	22.6%	NA	16.9%	NA
Cycling	4.8%	NA	0.3%	NA
Other	1.3%	NA	0.1%	NA

Sources: Population, buildings, and modal split data: Statistics Portugal. Available online: www.ine.pt (accessed on 22 February 2021); Istituto Nazionale di Statistica. Available online: hppt://www.istat.it (accessed on 23 February 2021). Transport infrastructure data: Municipality of Porto. Available online: https://pdm.cm-porto.pt/documentacao (accessed on 15 February 2021); Piano Urbano della Mobilità Sostenibile. Available online: https://pumsbologna.it/ (accessed on 23 February 2021); Sociedade de Transportes Colectivos do Porto. Available online: www.stcp.pt (accessed on 17 February 2021); Metro do Porto. Availabe online: metrodoporto.pt; (accessed on 17 February 2021); Tper–Trasporto Passeggeri Emilia-Romagna. Available online: https://www.tper.it/ (accessed 23 February 2021); Servizio Ferroviario Metropolitano Bologna. Available online: https://www.sfmbo.it/ (accessed on 23 February 2021).

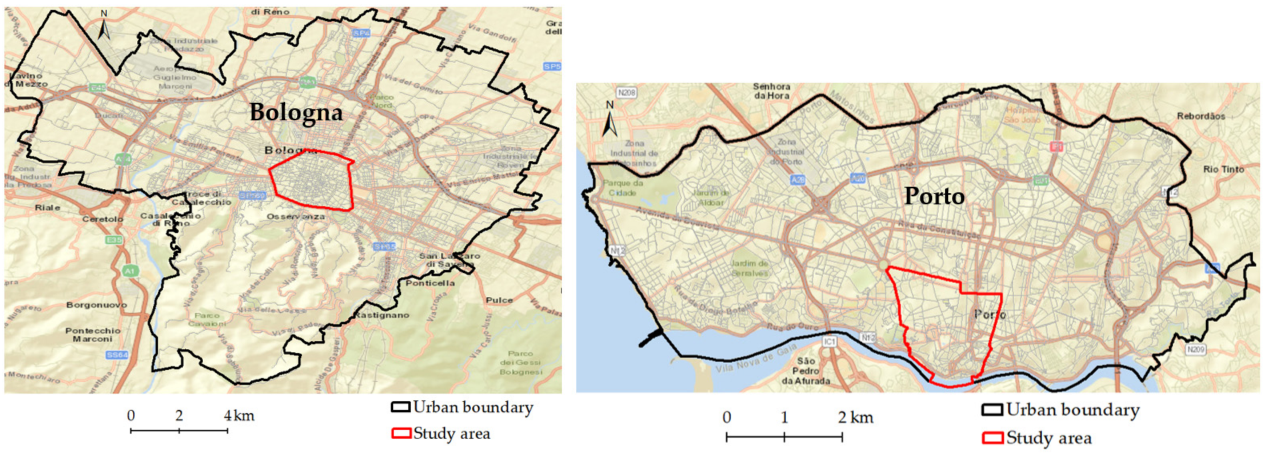

Figure 1. Location of the cities of Bologna and Porto. Sources: ArcGIS World Street Map; Municipalities of Bologna and Porto.

Bologna and Porto are engaged in creating more sustainable and liveable urban environments, namely by reducing the negative impacts associated with motorized traffic. Bologna is one of the Italian cities with the greatest intensity of policies for promoting more sustainable mobility [61]. Increasing the use of active modes of transport has been a strategy assumed by both cities to reduce the volume of motorized traffic in the city centers. Improving pedestrian facilities and adopting measures to enhance traffic safety, such as low-speed streets and converting traffic roads into pedestrian-only streets, are examples of some measures undertaken to make these cities more pedestrian-friendly.

3.2. Data Collection and Analysis

The data flow diagram presented in Figure 2 summarizes the steps adopted for collecting and analyzing travel data.

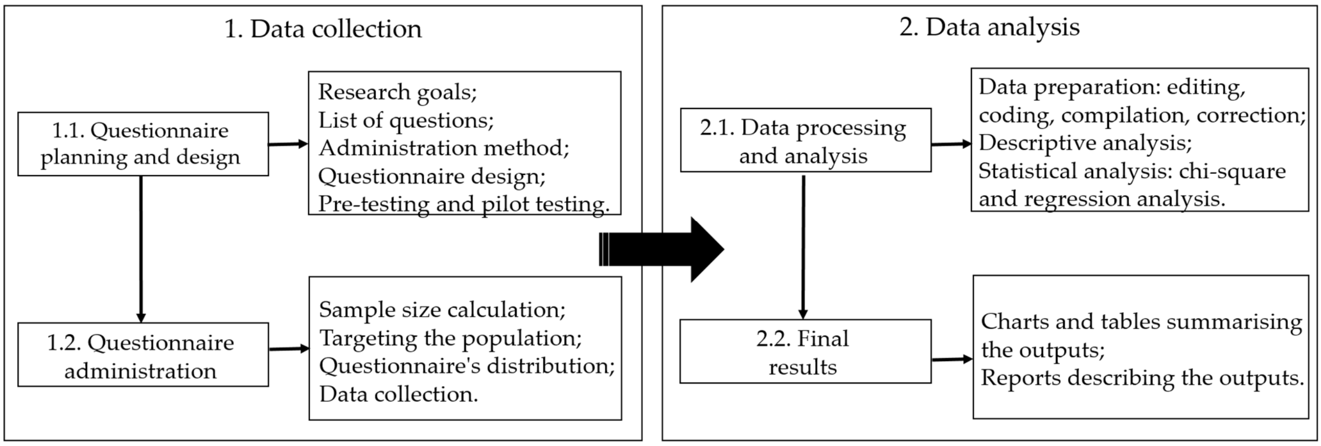

Figure 2. Flow diagram of data collection and data analysis.

Regarding the first phase of the work, it was decided to collect travel data from the community living and commuting to the central areas of Bologna and Porto by using a web-based questionnaire. Questionnaires are tools that have been widely adopted for collecting individual travel data [51–62]. The first step of the work consisted of developing the questionnaire according to research goals of SPN. The questionnaire was previously structured and based on a closed question format, containing 14 questions divided into three main parts. The first part included personal information related to gender, age, disability, education level, type of activity, and frequency of engaging in utilitarian walking in the city centers. The second part was addressed to participants that walk on a daily basis to reach their routine destinations (walkers). These individuals were asked to clarify: (i) the purpose/reason of their utilitarian walking; (ii) the daily average walking time; and (iii) if they just walk or use combined modes to reach their destinations. In the questionnaire, utilitarian walking was described as daily walking to the following routine destinations: work, school/university, shops, public transport, car parks, accessing services, and other destinations not given that respondents should identify. Walking time was preferred to walking distance, because people are more uncertain about distance and could also be confused between the direct distance and actual route distance if the question was posed in terms of length [63]. Travel time was also used to define the main mode of transport when combined modes of transport were declared. The main mode of transport was defined as the mode in which respondents spend more time travelling to reach their habitual destinations. The third part included questions specifically addressed to respondents that never or only occasionally use the pedestrian mode to reach their habitual destinations (non-walkers). These participants were asked to report on (i) the barriers preventing them from using the pedestrian mode, (ii) if they are available to walk more in the future, and (iii) the actions needed to engage them in utilitarian walking. For the various questions, several options were provided and respondents were asked to select one option per question. The questionnaire was developed on Google Forms to be administered through the Internet. A pilot test was conducted to gauge the meaning of the various questions and the overall organization of the questionnaire. As a result, some changes were carried out to improve the reliability and sensitivity of the questionnaire.

Then, it was necessary to define the minimum sample size required for this work. The widely used formula described by Israel [64] was used to calculate the sample size. This formula (Equation (1)) considers the population size, a confidence level, and a level of precision. In this study, we adopted a 95% confidence level and a level of precision of 5% to define the sample.

$$n = \frac{N}{1 + N(e)^2} \quad (1)$$

In Equation (1), n is the sample size, N is the population size, and e is the margin error. According to the equation and considering that the population in 2019 was 301,984 inhabitants in Bologna [65] and 216,606 in Porto [66], the sample size needed was 384 individuals in Bologna and 383 in Porto.

After defining the sample size, the questionnaire was administered through the Internet, targeting individuals that were living or commuting daily to the city centers of Bologna and Porto. The target population was approached through social media, project website, and through databases from the universities and from the municipalities of Bologna and Porto. In Bologna, the questionnaire was distributed in Italian from May to July, 2019; in Porto, the questionnaire was distributed in Portuguese from September to November, 2019. Thus, both questionnaires were conducted before the COVID-19 pandemic began, which abruptly changed our daily travel habits.

The second phase of the work comprised data analysis to extract key success features and shortcomings. After performing basic operations of data editing and data correction and compilation, conventional descriptive statistics were used to describe the main findings obtained regarding the levels and purposes of utilitarian walking, travel time and barriers preventing people from walking. This analysis was complemented with inferential statistical tests to find associations between the variables. Relationships between the variables were confirmed through Chi-square tests and a regression analysis. The statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) software. These statistical tests have been widely used in transport studies to compare variables and groups [67,68]. In this study, Chi-square tests were conducted to test associations between individual and geographic variables and utilitarian walking, purpose of walking, travel time, barriers preventing utilitarian walking, and action to improve walking in the future. The regression analysis was carried out to develop a predictive model for the frequency of walking according to the determinants of walking. The conventional level of $p \leq 0.05$ was taken to represent the statistical significance [51,69]. The obtained data were finally used to produce charts, tables, and other supports that helped us to understand the extent to which walking as a transport mode is used in both city centers and the barriers preventing people to engage in utilitarian walking.

4. Results

4.1. Sample Description

The questionnaire resulted in a total of 1438 responses. From these, 321 reported non-utilitarian walking episodes, such as walking for exercise in parks and in neighborhoods and walking a dog. These 321 responses were discarded, resulting in a total of 1117 questionnaires related to utilitarian walking.

From these 1117 questionnaires, 676 were from Bologna and 441 from Porto. Thus, the number of questionnaires collected in each city was greater than the minimum sample size required (384 and 383 for Bologna and Porto respectively). While insufficient sample size can have serious negative consequences on segment recovery, it is assumed that larger sample sizes improve data analysis [70]. In the specific case of travel surveys, Murat [71] reports that as the sample size increases, the parameter and error variances decrease.

Regarding sample description, as shown in Table 2, respondents were mostly people without any kind of physical or visual impairment, aged between 25–65 years old, employed fulltime, and having an undergraduate educational level. Females were slightly more representative in the sample. Residents were also more representative than commuters.

Table 2. Sample description.

Variable	Attributes	Questionnaire		Population (2019)	
		Total	%	Total	%
Gender	Female	612	54.8	325,817	53.5
	Male	505	45.2	282,773	46.5
Age	≤25 years old	160	14.3	126,256	20.8
	>25–≤65 years old	925	82.8	323,571	53.2
	>65 years old	32	2.9	158,763	26.0
Disability	No	1103	98.8	584,246	96.0
	Yes (physical/visual)	14	1.2	24,344	4.0
Education level	Undergraduate	697	62.4	472,437	77.6
	Graduate	420	37.6	136,153	22.4
Activity	Student	215	19.3	93,143	17.6
	Employed	885	79.2	254,220	48.0
	Other	17	1.5	182,649	34.4
Type of pedestrian	Resident	693	62.0	NA	-
	Commuter	424	38.0	NA	-
City	Bologna	676	60.5	391,984	64.4
	Porto	441	39.5	216,606	35.6

Source: Statistics Portugal (www.ine.pt) (accessed on 1 March 2021) and Statistics Italy (www.istat.it) (accessed on 1 March 2021).

As shown in Table 2, the survey sample's sociodemographic characteristics do not differ much from the population in some variables, such as gender, level of disability, people studying, and city of origin, but there are some deviations. People aged more than 65 years old and unemployed and retired people (activity "other") are underrepresented, while employed people and people aged >25–≤65 years old are overrepresented. Online samples are regarded as biased, especially in terms of age and education [72]. Some groups, such as elderly people with low levels of education, are less tech-savvy and can have limited Internet access. Nonetheless, as this paper deals with utilitarian walking, and as walking to work and to school/university usually constitutes the highest share of daily trips [20], the over and underrepresentation of the described groups in the sample is not expected to materially affect the results.

4.2. Utilitarian Walking in the City Centers of Bologna and Porto

One of the main goals of the questionnaire was to understand the extent to which walking is used as a transport mode for short urban trips in the central areas of Bologna and Porto. Results showed that from the overall respondents that travel daily to the central areas of Bologna and Porto, 21% used walking as a transport mode, 47% combine walking with other modes, and 32% travel by using other modes (Table 3). Thus, about 68% of the trips to these areas involve a relevant walking activity, because even in the case of using combined modes, walking always corresponds to the mode with the highest travel time. As shown in Table 3, Chi-square tests indicated that females were more likely to engage in utilitarian walking than males (1, $n = 1117$) = 32.256, $p < 0.001$) and that undergraduates were also more likely to engage in utilitarian walking than graduates (1, $n = 1117$) = 10.0625, $p = 0.002$). Moreover, the statistical tests also confirmed that people from Bologna were more likely to engage in utilitarian walking than people from Porto (1, $n = 1117$) = 117.0558, $p < 0.001$).

Table 3. Participant characteristics by walking habits.

Variables		Walkers				Non-Walkers		p-Value
		Just Walk		Combined				
		N°	%	N°	%	N°	%	
Total (n = 1117)		238	21.3	525	47.0	354	31.7	-
Gender	Female	148	24.2	314	51.3	150	24.5	<0.001*
	Male	90	17.8	211	41.8	204	40.4	
Age	≤25	39	24.4	72	45.0	49	30.6	0.833
	>25–≤65	193	20.9	435	47.0	297	32.1	
	>65	6	18.8	18	56.2	8	25.0	
Education	Undergraduate	160	23.0	340	48.7	197	28.3	<0.001*
	Graduate	78	18.6	185	44.0	157	37.4	
Activity	Student	66	30.7	90	41.9	59	27.4	0.329
	Employee	169	19.1	425	48.1	290	32.8	
	Other	3	16.7	10	55.5	5	27.8	
Type of pedestrian	Resident	181	26.1	294	42.4	218	31.5	0.594
	Commuter	57	1.7	231	66.2	136	32.1	
City	Bologna	138	20.4	406	60.1	132	19.5	<0.001*
	Porto	100	22.7	119	27.0	222	50.3	

* p-value < 0.05 (significant).

4.3. Purposes of Utilitarian Walking

The purposes of utilitarian walking to the central areas of Bologna and Porto are summarized in Table 4. Walking to work was reported as the most representative purpose for travelling to these areas (65%). Other less reported purposes included: walking to school/university (19%), walking to shops (8%), walking to public transport (4%), walking to car parks (2%), and walking for other reasons, such as to access services (2%). As illustrated in Table 4, the statistical analysis identified significant correlations between several variables and the purpose of walking. Thus, utilitarian working was significantly correlated with age (1, n = 763) = 181.935, $p < 0.001$), education level (1, n = 763) = 34.990, $p < 0.001$), activity (1, n = 763) = 261.194, $p < 0.001$), and type of pedestrian (1, n = 763) = 12.724, $p < 0.001$), confirming that walking to work was more likely to be done by the adult population (>25–≤65 years old) who have an undergraduate education level, are employed, and living in the cities (residents). The analysis also confirmed that people from Bologna were more likely to walk to work than people from Porto (1, n = 763) = 25.957, $p < 0.001$). In terms of utilitarian walking to school/university, the analysis identified significant correlations between walking and age (1, n = 763) = 356.160, $p < 0.001$), education level (1, n = 763) = 44.838, $p < 0.001$), activity (1, n = 763) = 458.508, $p < 0.001$), type of pedestrian (1, n = 763) = 6.521, $p < 0.001$), and the cities (1, n = 763) = 44.317, $p < 0.001$). Thus, utilitarian walking to school/university is more representative among students (<25 years old) who live in the respective cities.

Table 4. Purposes of utilitarian walking by individual and geographic variables.

Variables		Work	School/University	Shop	Public Transport	Car Parking	Other
Total (n = 763)		65.0%	19.3%	8.1%	4.2%	1.8%	1.6%
Gender	Female (%)	61.5	56.5	69.4	68.7	35.7	33.3
	Male (%)	38.5	43.5	30.6	31.3	64.3	66.7
	p-value	0.468	0.259	0.139	0.332	0.549	0.518
Age	≤25 (%)	2.0	64.4	6.4	6.3	7.1	7.7
	>25–≤65 (%)	95.2	34.3	87.1	90.6	85.7	84.6
	>65 (%)	2.8	1.3	6.5	3.1	7.2	7.7

	p-value	<0.001 *	<0.001 *	0.616	0.394	0.526	0.521
Education	Underg.(%)	58.1	89.1	72.6	78.1	50.0	33.3
	Gradu. (%)	41.9	10.9	27.4	21.9	50.0	66.7
	p-value	<0.001 *	<0.001 *	0.223	0.125	0.217	0.018 *
Activity	Student (%)	3.8	84.4	12.9	9.4	14.3	7.7
	Employee (%)	95.8	14.3	80.6	87.5	78.6	76.9
	Other (%)	0.4	1.3	6.5	3.1	7.1	15.4
	p-value	<0.001 *	<0.001 *	0.002 *	0.234	0.214	<0.001 *
Type of Pedestrian	Resident (%)	57.7	71.4	80.6	56.2	57.1	66.7
	Commuter (%)	42.3	28.6	19.4	43.8	42.9	33.3
	p-value	<0.001 *	0.010 *	0.002 *	0.474	0.691	0.751
City	Bologna (%)	77.4	48.9	67.7	84.4	64.3	83.3
	Porto (%)	22.6	51.1	32.3	15.6	35.7	16.7
	p-value	<0.001 *	<0.001 *	0.518	0.947	0.558	0.352

* *p*-value < 0.05 (significant).

Additionally, the study showed that students in Porto were more likely to walk to school/university than students in Bologna. Regarding walking to shops, the only two variables significantly correlated were the type of pedestrian (1, n = 763) = 9.713, p 0.002) and the type of activity (1, n = 763) = 12.152, p = 0.002). In this case, the statistical analysis confirmed that walking to shops mostly involved residents and employed people. Finally, utilitarian walking for other purposes was found to be statistically correlated with the education level, (1, n = 763) = 5.595, p = 0.018), and with the type of activity, (1, n = 763) = 17.095, $p < 0.001$), showing that it was more likely to involve graduates and employed people.

Further to the above analysis, a multiple linear regression analysis was carried out separately for Bologna and Porto to develop a predictive model for the frequency of walking in both cities. The model considered as determinants the peoples' main purposes of walking, such as going to school/university, to work, to public transport, to shops, to car parks, and for accessing services. The results of this linear regression model are shown in Tables 5 and 6.

Table 5. Regression model fitness.

City	R	R Square	Adjusted R Square	Std. Error of the Estimate
Bologna	0.848	0.719	0.717	19.845
Porto	0.931	0.867	0.866	16.538

Table 6. Regression coefficients for walking frequency in Bologna and Porto.

Determinants	Unstandardized Coefficients		Standardized Coefficients BETA	*t* Value
	B	Std. Error		
		Bologna		
(Constant)	4.607	1.677	-	2.747
School/University	82.530	2.638	0.706	31.286
Work	85.857	1.913	1.142	44.879
Public Transport	79.316	3.593	0.451	22.074
Services	69.893	6.496	0.205	10.760
Shops	76.575	2.963	0.557	25.843
Car parks	85.484	6.214	0.263	13.756
		Porto		
(Constant)	0.667	1.102	-	0.605
School/University	88.849	2.039	0.749	43.582

Work	87.182	1.761	0.861	49.503
Public Transport	79.958	5.950	0.216	13.439
Services	63.333	6.347	0.160	9.978
Shops	71.606	2.726	0.438	26.268
Car parks	73.833	5.345	0.222	13.815

In the case of Bologna, the model explains 72% (adjusted R squared, Table 5) of the variation in the dependent variable, which in our case is walking frequency. This is a score out of a hundred representing a scale from low (occasionally) to high (daily) walking levels. The hypotheses test on the estimated coefficients prove to be significant at the 0.01 level. The interpretation of the coefficients shows that the predicted value for walking frequency is 90 out of a hundred for people going to work and to car parks. Walking frequency score is predicted to be 87 for people going to school/university. People who use public transport are expected to also walk very frequently, with a score of 84. In the case of people doing their shops, the predicted walking frequency score is 81. Similarly, for people accessing services, the predicted score is 75.

In the case of Porto, the model explains 87% (Table 5) of the variation in the dependent variable (walking frequency). The hypotheses test on the estimated coefficients also prove to be significant at the 0.01 level. The coefficients for Porto included in Table 6 show that the predicted value for walking frequency score is 90 out of a hundred for people going to school/university and 88 for people going to work. In the case of people who walk for public transport, the score is also high (81). Regarding the people walking to car parks and to shops, the predicted walking frequency scores are 75 and 72, respectively. Like in Bologna, the predictive value for walking frequency for accessing services was the lowest (64).

The model yields an R-squared (adjusted) greater than 71%, providing a good fit to the data according to model diagnostics. The comparison of the predictive values of the walking frequency showed that both cities have similar scores, which are quite high in the cases of walking to school/university and to work. For the remaining walking determinants, there were some differences in the predicted walking frequency scores. Globally, Bologna shows higher scores in the walking frequencies to the various destinations. The score of the walking frequency to shops, the third most relevant trip purpose, was much higher in Bologna than in Porto. The different walking frequency scores found could reflect the different conditions provided by the two city centers, suggesting that the central area of Bologna is more conducive for walking than the central area of Porto.

4.4. Walking Time

Respondents were also asked to report their average utilitarian walking time (one-way) to their routine destinations. The results are summarized in Table 7. Globally, 44% of the respondents walked for 10 to 20 min, 28% for 20 to 30 min, about 15% walked for less than 10 min, and about 13% walked more than 30 min. In terms of travel distance and considering an average walking speed of 5 km/h [14], results indicated that 15% of respondents walked less than 0.8 km, 44% walked between 0.8 and 1.6 km, 28% walked between 1.6 and 2.5 km, and about 13% walked more than 2.5 km to reach their usual destinations.

Table 7. One-way average walking time, modes used, and corresponding walking distance.

Reported Walking Time			Just Walking		Combined Modes		Estimated Walking Distance
Time Classes	**N°**	**%**	**N°**	**%**	**N°**	**%**	
<10 min	111	14.6	27	11.3	84	16.0	<0.83 km
≥10–<20 min	332	43.5	98	41.2	234	44.6	≥0.83–<1.65 km
≥20–<30 min	217	28.4	68	28.6	149	28.4	≥1.65–<2.50 km

≥30 min	103	13.5	45	18.9	58	11.0	≥2.50 km

Some variables influenced the time spent walking, but these differences were not very substantial (Table 8). The statistical tests identified significant correlations between the modes used and the respective city (1, n = 763) = 29.963, p < 0.001), the type of pedestrian (1, n = 763) = 28.017, p < 0.001) and the type of activity (1, n = 763) = 11.351, p = 0.003). Thus, combined modes were more likely to be used in Bologna, by commuters and by employed and "other" (retired and unemployed) people. In addition, significant correlations were also identified between gender and short utilitarian walking episodes (1, n = 763 = 4.602, p = 0.003), between age and long walking episodes (1, n = 763 = 8.134, p = 0.017), and between the type of activity and long walking episodes (1, n = 763 = 9.189, p = 0.010). Thus, the statistical analysis confirmed that short utilitarian walking (< 10 min) was more likely to be done by females, while long trips (>30 min) were more likely to be done by adults and by employed and "other" (retired, unemployed) people.

Table 8. One-way average walking time and modes used by individual and geographic variables.

Variables		Average Walking Time			
		<10 Min (%)	**≥10–20 Min (%)**	**≥20–30 Min (%)**	**≥30 Min (%)**
Total (n = 763)		14.6	43.5	28.4	13.5
Gender	Female	12.4	45.2	28.8	13.6
	Male	17.9	40.9	27.9	13.3
	p-value	0.032 *	0.233	0.792	0.890
Age	≤25	18.0	49.6	26.1	6.3
	>25–≤65	14.0	42.7	28.2	15.1
	>65 (%)	12.5	37.5	45.8	4.2
	p-value	0.522	0.337	0.144	0.017 *
Education	Undergraduate	13.8	43.6	29.0	13.6
	Graduate	16.0	43.3	27.4	13.3
	p-value	0.419	0.946	0.637	0.910
Activity	Student	19.2	45.5	27.6	7.7
	Employee	13.4	43.4	28.6	14.6
	Other	8.4	25.0	33.3	33.3
	p-value	0.157	0.380	0.903	0.010*
Type of Pedestrian	Resident	13.9	42.9	30.4	12.8
	Commuter	15.6	44.5	25.3	14.6
	p-value	0.511	0.686	0.140	0.495
City	Bologna	14.0	42.6	28.7	14.7
	Porto	16.0	45.6	27.9	10.5
	p-value	0.476	0.447	0.820	0.125

* p-value < 0.05 (significant).

The average walking time according to the purpose of walking (Figure 3) shows that the class 10–20 min was the most representative. The shortest trips (<10 min) were more representative among those walking to car parks, while the longest trips (>30 min) were more expressive among those walking to work, public transport, and other destinations.

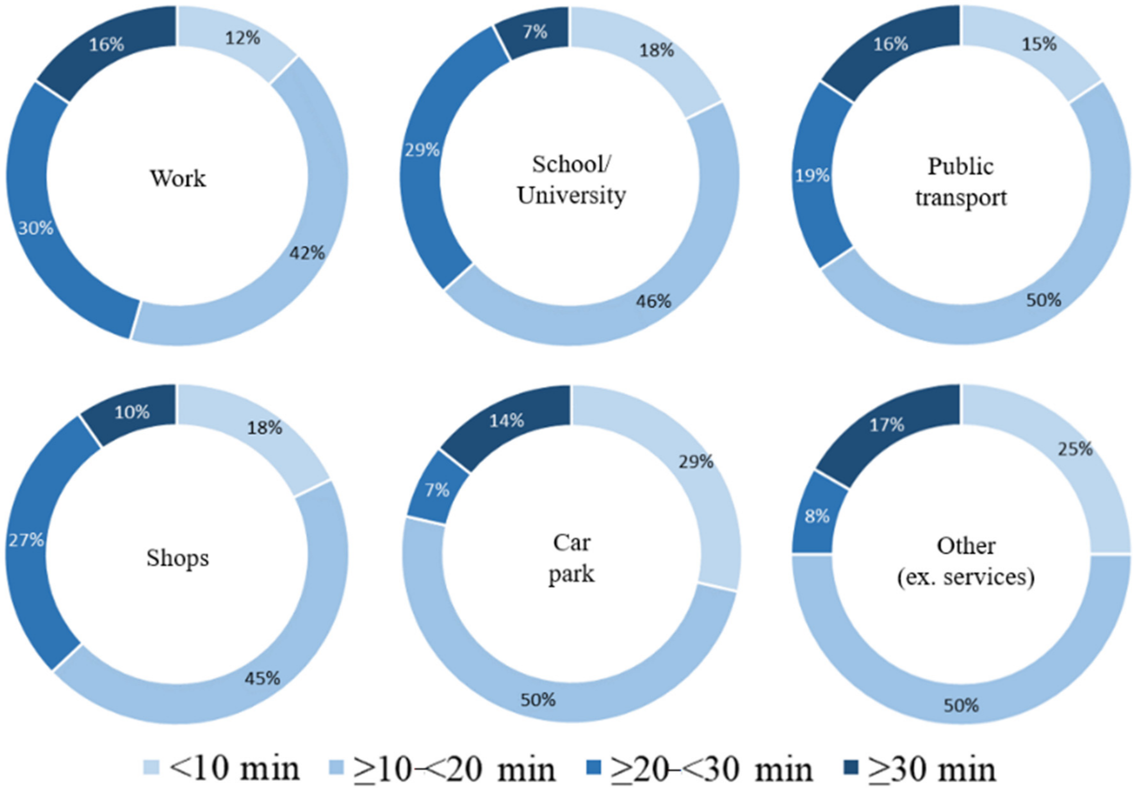

Figure 3. Walking time classes (%) according to the purpose of walking.

4.5. Barriers Preventing Utilitarian Walking

As shown in Table 3, 32% of the respondents (n = 354) were classified as non-walkers, as they never (n = 70) or only occasionally/rarely (n = 524) used the pedestrian mode to reach their habitual destinations in the central areas of Bologna and Porto. As also described in subSection 4.2, non-walkers were more likely to be males and commuters having a high education level. They were also much more representative in Porto (50%) than in Bologna (20%).

The barriers preventing utilitarian walking are presented in Table 9. Travel distance was reported by 75% of the participants as the main barrier for engaging in utilitarian walking. The following reported barriers were travel time (17%) and the lack of suitable sidewalks (2%). The other mentioned barriers included various issues, such as the lack of physical condition to walk, lack of traffic safety, security concerns, preference by alternative modes of transport, too much to carry, weather conditions, and need to perform other activities after work, among others.

Table 9. Barriers preventing utilitarian walking by individual and geographic variables.

Variables		Travel Distance	Travel Time	Bad Sidewalks	Other
Total (n = 354)		75.1%	16.7%	2.3%	5.9%
Gender	Female (%)	56.4	69.5	37.5	47.6
	Male (%)	43.6	30.5	62.5	52.4
	p-value	0.413	0.043 *	0.243	0.338
Age	≤25 (%)	16.5	3.4	0.0	14.3
	>25–≤65 (%)	81.6	94.9	100	76.2
	>65 (%)	1.9	1.7	0.0	9.5
	p-value	0.003 *	0.034 *	-	0.068
Education	Undergraduate (%)	55.3	55.9	12.5	76.2
	Graduate (%)	44.7	44.1	87.5	23.8

	p-value	0.799	0.961	0.012 *	0.051
Activity	Student (%)	20.3	3.4	0.0	14.3
	Employee (%)	78.6	94.9	100	81.0
	Other (%)	1.1	1.7	0.0	4.8
	p-value	0.005 *	0.011 *	-	0.414
Type of pedestrian	Resident (%)	57.1	72.9	87.5	76.2
	Commuter (%)	42.9	27.1	12.5	23.8
	p-value	0.002 *	0.501	0.127	0.155
City	Bologna (%)	33.8	50.8	12.5	52.4
	Porto (%)	66.2	49.2	87.5	47.6
	p-value	0.019*	0.018 *	0.142	0.141

* p-value < 0.05 (significant).

A statistical analysis was performed to identify possible correlations between the barriers preventing utilitarian walking and the various individual and geographic variables (Table 9). Distance was significantly correlated with age (1, n = 354) = 7.001, p = 0.003), activity (1, n = 354) = 10.558, p = 0.005), type of pedestrian (1, n = 354) = 8.912, p = 0.002), and the respective city (1, n = 354) = 5.457, p = 0.019). Therefore, distance was a barrier more likely to prevent adults, residents, and the employed population from engaging in utilitarian walking. In addition, distance was more likely to prevent people from Porto from engaging in utilitarian walking than people from Bologna. The travel time was found to be significantly correlated with gender (1, n = 354) = 4.081, p = 0.043), age (1, n = 354) = 6.712, p = 0.034), activity (1, n = 354) = 9.016, p = 0.011), and city of origin (1, n = 354) = 5.566, p = 0.018). This analysis confirmed that travel time was a barrier more likely to prevent females, adult individuals, and employed people from engaging in utilitarian walking. Geographically, the analysis also confirmed that travel time has greater odds of preventing people from Porto for walking. A relation between the level of education and not walking due to the bad condition of sidewalks was also found. This barrier was more likely to prevent high educated people from utilitarian walking.

When asked about the future, 77% of non-walkers expressed their wish to be more engaged in utilitarian walking. Of these, 80% were respondents that occasionally already travel by foot to their routine destinations.

The actions that can potentially cause this modal shift are shown in Table 10. For 45% of non-pedestrians, it is essential to improve the conditions of the sidewalks so that they start using the pedestrian mode in their daily trips. Other actions include improving traffic safety (17%), providing better street greenery (9%), street connectivity (8%), and security (6%), among many other less mentioned measures.

A significant correlation was found between the two cities and the quality of sidewalks ((1, n = 354) = 7.699, p = 0.005), and the street connectivity ((1, n = 354) = 9.477, p = 0.002). Improving the sidewalks was an action mostly reported by participants from Porto, while the need to enhance sidewalk connectivity was mostly reported by people from Bologna. This could be related to the different conditions provided by the two city centers. Regarding the individual variables, the only statistically significant correlation was found between the type of pedestrian and the need to improve public transport (1, n = 354) = 6.752, p = 0.009). In this case, commuters were much more concerned about this action than residents.

Table 10. Actions to engage non-walkers in utilitarian walking by individual and geographic variables.

Variables		Condition of Sidewalks	Traffic Safety	Street Greenery	Street Connect.	Security	Public Transport	Other
Total (n = 354)		44.7%	16.8%	8.5%	8.0%	6.0%	2.0%	14.0%
Gender (%)	Female	56.7	66.1	51.7	57.1	66.7	57.1	48.0
	Male	43.3	33.9	48.3	42.9	33.3	42.9	52.0
	p-value	0.749	0.149	0.502	0.956	0.387	0.979	0.137
Age (%)	≤25	14.6	16.7	20.7	14.3	22.7	0.0	2.1
	>25–≤65	83.4	81.6	79.3	82.1	72.7	100	93.8
	>65	2.0	1.7	0.0	3.6	4.6	0.0	4.1
	p-value	0.864	0.751	-	0.883	0.328	-	0.029 *
Education (%)	Underg.	54.1	54.2	62.1	64.3	71.4	42.9	50.0
	Grad./Pg	45.9	45.8	37.9	35.7	28.6	57.1	50.0
	p-value	0.609	0.810	0.468	0.337	0.133	0.491	0.385
Activity (%)	Student	17.8	18.3	20.7	14.3	27.3	0.0	6.3
	Employee	80.3	80.0	79.3	85.7	68.2	100	93.7
	Other	1.9	1.7	0.0	0.0	4.5	0.0	0.0
	p-value	0.662	0.911	-	-	0.153	-	-
Type of Pedestrian (%)	Resident	62.4	67.8	75.9	50.0	52.4	14.3	60.0
	Commuter	37.6	32.2	24.1	50.0	47.6	85.7	40.0
	p-value	0.772	0.282	0.099	0.189	0.371	0.009 *	0.804
City (%)	Bologna	29.3	40.7	51.7	64.3	42.9	0.0	60.1
	Porto	70.7	59.3	48.3	35.7	57.1	100	59.9
	p-value	0.005 *	0.555	0.093	0.002 *	0.586	-	0.668

* p-value < 0.05 (significant).

5. Discussion

To encourage people to walk, the purposes of walking need to be understood, as they pose different time–space constraints. This study analyzes utilitarian walking in the central areas of Bologna and Porto. Based on the findings of a questionnaire (n = 1117), the study specifically analyzes the extent to which walking is used as a transport mode in these city centers, the purposes of walking, walking travel times, barriers preventing walking, and the actions that may increase the number of people travelling by foot in the future.

The findings indicate that an important share of the daily trips to the central areas of Bologna and Porto involve walking: 21% travel by foot, 47% combine walking with other modes, and 32% travel by using other modes of transport. This means that 68% of the daily trips involve walking activity, which brings important outcomes in terms of the sustainability of these areas and in terms of the health lifestyles. Firstly, the results obtained revealed a walking share component higher than that reported on the travel surveys from the last Census of 2011. Besides the gap of eight years between the Census and the questionnaire, the findings suggest that a higher number of people travel to these areas by using more sustainable modes. In 2011, as shown in Table 1, private motorized modes ensured more than 50% of the trips to both cities. This study suggests a decrease in the use of private motorized modes and an increase of walking combined with other modes, especially in Bologna. However, this analysis does not evaluate the mobility at the urban scale, but only at the city centers of Bologna and Porto. Various studies have shown that city centers are the most pedestrian-friendly areas in the cities. For example, Stockton et al. [73] and Ribeiro and Hoffimann [37] identified a radial decay in walkability from the center to the periphery of London and of Porto Metropolitan Area, respectively. The higher walkability in city centers is explained by various reasons, including higher land use mixes, which reflect a greater proximity to nearby destinations, such as shops and restaurants, higher street connectivity, and greater public transport coverage associated with restrictions to car traffic and parking. The data presented in Table 1 confirm that the city centers of Bologna and Porto have higher street and intersection densities than the remaining urban areas, have higher density of public transport stops, and a higher percentage of non-residential buildings, which indicates a greater diversity of uses (retail, restaurants, services) on these areas. These variables suggest that the city centers of Bologna and Porto are more conducive for walking than the remaining urban areas, which could encourage the use of the pedestrian mode and combine walking with other modes, such as public transport.

In this study, utilitarian walking was associated with various individual and geographic variables, confirming previous findings in this domain [57,74,75]. In our study, females were found to be more likely to walk than males. This is in line with some recent studies indicating that females tend to use more active modes of transport than males [51,58]. The study also showed that the percentage of walkers under 25 years old was lower than the percentage of walkers aged more than 65 years old. This finding contradicts the conclusions of other studies, where older adults and elderly people were found to be less likely to walk [55,56], but corroborates recent studies reporting that seniors were more likely to walk than their younger counterparts [52]. Less educated people were found to be more likely to walk than highly educated people. More specifically, commuting to school and to work was positively associated with walking for less educated people. This finding confirms previous research showing that more educated individuals tend to walk less [76]. The educational level can be regarded as a measure of socioeconomic status [77]. Thus, highly educated people usually have not only the highest paid jobs, but also stressful and exhausting activities [8]. These reasons could discourage highly educated people from utilitarian walking.

In terms of trip purpose and confirming previous research [20], we found that utilitarian walking was mostly justified by working (65%) and by school/university trips (19%). The share of walking trips to school/university was higher than that reported in other studies carried out in medium-sized cities located in the Southern Europe. For example, in a research of the daily commuting patterns in two universities located in Spain and Portugal, Gurrutxaga et al. [78] and Ribeiro et al. [51] found that 22% of the trips were made by foot. In our sample, we found that 38% of the students exclusively used the pedestrian mode for commuting to their schools/universities. Identically, the percentage of people that exclusively walk to reach their work in these central areas is higher than the described in some studies. In our sample, the percentage of walkers that exclusively walk to their jobs was 31%, which is above the values described for walking trips in other European countries such as Germany and Sweden [56]. In turn, walking to shops is lower than the reported by Ton et al. [79] in the Netherlands (38%). Moreover, the global value of people that exclusively walk to their routine destinations in the centers of Bologna and Porto (31%) do not much differ from some Nordic countries, where the use of active modes is more common. For example, the walking share found in the centers of Bologna and Porto is close to the share of Helsinki (35%) reported by Ramezani et al. [80].

In this study, we also found significant correlations between trip purpose, individual variables, and travel time. Young people and students were comprehensively found more likely to walk to school/university, but not to other destinations. Walking to work, school/university, and shops was found more likely to be done by residents than by commuters. This could be related to the greater travel distance and time required to commute from distant places that comprehensively cannot be done by walking, as confirmed in previous studies [81]. This was also confirmed by the fact of commuters being more likely to use combined modes of transport than just walking to destinations. Regarding travel time, the study found that walking to car parks, shops, and school were globally shorter than walking trips to work and public transport. This is in line with previous findings showing that walking trips for education and shopping were shorter than walking trips for work [34]. The time spent walking mostly comprised between 10 to

20 min (44%) and between 20 to 30 min (28%). These travel times were quite long considering the nature of utilitarian walking trips: they are much longer than the referential 10 and 15 min reported in some travel studies [14,18,37,82] and longer than the walking trips reported in other Southern European countries. For instance, in the Spanish city of Granada, Ferrer and Ruiz [30] described that 80% of walking trips are shorter than 20 min. Some other correlations were also found: males walk less but for longer periods than females, and the longest trips (>30 min) were more likely to be done by adults.

As mentioned in the introduction, daily walking is a way of doing physical activity that brings various health benefits. Besides mostly involving short trips, utilitarian walking can contribute to the population meeting recommended levels of physical activity, which is valuable information for healthcare professionals [83,84]. By adopting the four utilitarian walking categories defined by Wasfi et al. [85], it can be concluded that 32% of the participants were non-walkers, 1% had low activity (<1 walking hour/week), 49% were moderately active (1–5 h/week), and 18% were high active (>6 h/week). These walking times, which were similar to those found by Wasfi et al. [85] in the Canadian context, suggest that, to some extent, utilitarian walking contributes to meeting the WHO recommendations (minimum of 10 min of walking). In terms of moderate-intensity physical activity and according to the WHO [7], adults should walk at least 150 min throughout a week. In our sample, the amount of people walking >150 min per week, e.g., more than 30 min per weekday, was about 9%. When compared to other studies, for example in some US cities [23], the percentage of walkers on moderate-intensity physical activity in Bologna and Porto is lower, which could be explained by the compact urban structure of these two cities. Nonetheless, as highlighted by Tudor-Locke et al. [86], some physical activity is better than none, and this study shows that besides the characteristics of utilitarian walking, which is usually faster and shorter than recreational walking, it is an important source of physical activity for many individuals in both cities.

Besides the global findings described, the study also found a distinct pattern of utilitarian walking between Bologna and Porto. In our sample, walkers were much more likely to be from Bologna than from Porto; work utilitarian trips were more likely to be done in Bologna, while school/university commuting was more likely to be done in Porto. Findings also confirmed that travelling by using combined modes was much more significant in Bologna. This could be related to the much larger surface of Bologna that makes it inviable to travel exclusively by foot, and also to the fact that the number of commuters is more representative in Bologna (42%) than in Porto (27%). The lower share of walking in Porto could be explained by various factors. As mentioned in the literature review, the characteristics of the built environment (street connectivity, land use mix, public transport stops density, pedestrian infrastructure, etc.) highly influence utilitarian walking [55,85]. The built environment data provided in Table 1 shows that the city center of Bologna has higher densities in terms of population, street intersection, and public transport stops than the city center of Porto. The city center of Porto is hillier than Bologna, which is also a factor that deters people from walking, namely elderly pedestrians [87]. In addition, the city center of Bologna has about 38 km of porticoes [88] that provide protection from adverse weather conditions to pedestrians. These differences may help in understanding the lower share of utilitarian walking found in Porto. The study carried out by Jabbari et al. [60] also demonstrated that the city center of Porto provides diverse and in some areas poor conditions to pedestrians. This is also confirmed by the fact that some participants from Porto claimed a better pedestrian infrastructure and a better public transport service. As reliable public transport services have been correlated with people's usage [51,89], improving the service provided could led to an increased use of public transport in the future. Sociocultural factors have been reported by their influence on travel behavior [13], but we do not have enough evidence about the extent to which these factors influence the different patterns of walking on the two city centers. Based on these various findings, the city center of Porto seems to be less attractive for pedestrians than the center of Bologna. This may explain the fact that 50% of the trips in the center of

Porto are not made by walking or walking in combination with other modes. This was also confirmed by the regression model: Bologna obtained higher walking frequency scores than the city center of Porto.

This study also showed that distance was the main barrier preventing utilitarian walking to routine destinations, confirming previous research in this field [15,27]. Distance is the key determinant of walking particularly for the elderly population due to the physical effort required [90]. Nonetheless, in our study, distance was more reported as a barrier by the young (90%) than by old individuals (62%). The unavailability of young people to engage in long utilitarian walking could be related to the need to follow school schedules. In this study, distance is a barrier that limits commuters more than residents from walking. This could be explained by the usually greater distances travelled by commuters compared with the people living in the cities. Travel time was identically correlated with non-walking, but also appeared as a barrier for females. This could be explained by some household tasks that are still done more by females (helping children to get ready for school, preparing meals), which make them more time limited for walking. Poor infrastructure was also reported as a barrier to walking, confirming previous studies in this field [25]. It was also demonstrated that sidewalks in poor conditions were more likely to restrict higher educated people from walking than their less educated counterparts. This confirms previous studies reporting that educated people appreciate walking in pedestrian-friendly environments [91].

Finally, many non-walkers (61%) expressed their wish to become more active in the future. Moving from less walkable to more walkable environments, especially improving the conditions of sidewalks, traffic safety, and street connectivity, were the actions globally required to change travel behaviors. The improvement of pedestrian conditions in cities has resulted in an increase in the volume of utilitarian walking [84]. Thus, the implementation of these measures seems to be particularly important in Porto, as shown by the fact that some non-pedestrians claimed better conditions for walking.

6. Conclusions

Utilitarian walking for fulfilling daily specific purposes brings many benefits for individuals and urban environments. Planners and public health authorities have tried to design and implement policies to encourage people to walk to their habitual destinations. Understanding the individual and geographic triggers for utilitarian walking is vital to promote healthier lifestyles and more sustainable mobility. This paper examined the extent to which walking is used as a transport mode for short urban trips in the centers of two medium-sized European cities, Bologna and Porto. The findings of this study revealed interesting insights into how individual and geographic variables influence utilitarian walking. In the sample analyzed (n = 1117), we found that 21% of the individuals travel exclusively by foot, while 47% combine walking with other modes of transport. This means that 68% of the daily trips to the central areas of these cities involve walking activity. We also found that females walk more than males but for shorter times, that young people under 25 years old walk less and for shorter periods than their older counterparts, and that high educated people walk less than people with lower qualifications. Utilitarian walking to work and to school were the most representative by periods of time comprising between 10–20 min. We also found that people from Bologna walk much more and for longer periods than the people from Porto. Moreover, the study also highlights that daily short urban trips are an important source of physical activity that brings important health outcomes: 49% of the users walk between 1 to 5 h/week.

The analysis showed that the city center of Bologna is more conducive to walking than the center of Porto. The study also suggests that these city centers have a share of utilitarian walking that compares to the values reported in countries where active modes are more consistently used. In the future, the conditions provided by the cities should be analyzed to confirm how different the walkability levels at the urban scale are. This information could be helpful to support the adoption of policies to improve walkability at the entire cities. The barriers preventing utilitarian walking already contained some clues, as some respondents mostly from Porto requested better sidewalks, public transport services, and traffic safety to start to change their travel habits towards more sustainable modes of transport. In addition, measures to restrict and discourage car traffic can make the centers of these cities more walkable and mitigate the impact of some barriers, such as traffic safety. Encouraging people to be more active, especially the young people, could also contribute to achieve a greater modal change in the future.

This study has some limitations, which should be considered to underestimate or overstate the results. The described results are based on a questionnaire, meaning that results are based on self-reported usage and not on direct observations. Subjective evaluations can contain inconsistencies between reported options/preferences and individual behaviors. Some groups, especially elderly people, are under-represented due to the difficulties in targeting these people with a web-based questionnaire. Thus, the travel behavior of this population was not representative. Other variables such as having a car, driving license, and income, among others, were not evaluated. As these variables may also influence travel behavior, they should be considered in future studies.

Besides the limitations, this paper contributes to a better understanding of utilitarian walking trips in the centers of these two European cities. As short urban trips are often kept aside from travel surveys, these trips are under-estimated. This study demonstrates that walking, alone or in combination with other modes, has several relevant urban, transport, and health implications. The better understanding of the travel habits provided in this study can help urban planners and policymakers to develop and improve policies to encourage a more sustainable urban mobility in these cities.

According to the findings of this study, special attention should be given to the: i) improvement of the walking conditions, through a network of footpaths to provide comfortable and safe conditions for pedestrians; ii) enhancement of the public transport service so that more people can combine walking with public transport; iii) adoption of policies to enhance traffic safety, such as by limiting car access to city centers, reducing traffic speeds, converting streets and areas into exclusive pedestrian (and cycling) zones, closing streets to traffic on weekends, and limiting car access and parking into universities, among others.

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