



Investigating the Perception of the Elderly Population About Comfort, Safety and Security When Using Active Modes of Transport

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Abstract. Promoting active modes of transport, such as walking and cycling, has a positive impact on environmental sustainability and the health and well-being of citizens. This study explores the elderly population's perception of comfort, safety and security when using active modes of transport. It begins with a systematic review of the literature considering research works that relate to active travel, the elderly population, and random forest. Then a questionnaire was applied to 653 participants and the results were analyzed. This analysis consisted of using statistics to evaluate the socio-demographic profile, the preferences regarding the use of active modes of this population, and the importance given to each dimension: comfort, safety, distance, and time, comparing these indicators through the Wilcoxon Rank Sum test and the Random Forest algorithm. The results showed that people over 56 years old walk as much as younger people. Furthermore, the importance given by this group of people to indicators referring to active modes is related to safety and security, distance, time, and comfort. The statistical results of the Wilcoxon Rank Sum test indicate the most important indicators: Adequate Travel Distance & Time and Existence of Commercial Areas by age group [0–55], and Absence of Allergenic and Existence of Green Areas by age group [56+]. Finally, the Random Forest algorithm provides the relative importance for both age groups, [0–55] and [56+], where the indicators that stand out in the [56+] age group, which is the focus of our study, are air quality, adequate travel distance & time, adequate crowd density, adequate thermal sensation, absence of allergenic, good street illumination level, adequate traffic volume, and adequate noise level.

Keywords: Active modes · Comfort · Safety · Security · Descriptive statistic · Wilcoxon Rank Sum test · Random Forest · Erdely

1 Introduction

The improvement of urban mobility is a concern regarding the growth of cities. There is an incentive to use less polluting means of transport, such as active modes, which include cycling and walking, for the sustainable development of cities.

Several studies show that safety, security, and comfort are decisive factors in the choice of mode of transport [3,18] and [13]. With the lack of perception of safety, security, and comfort among the main issues that deter people from bicycling [16], and walking [4]. The importance of these perceptions is even more pressing in the case of more vulnerable populations, such as the elderly [9].

The goal of this study is to evaluate the users' preferences related to comfort, safety, and security in urban mobility for users above 56 years old that use active modes.

The research questions of this work are described below.

1. What indicators related to the perception of comfort, safety, and security are more important for people above 56 years old?
2. What is the relative importance attributed to the indicators on the use of active modes by the age group over 56 years old?

The methodology followed in this work includes the following three steps: 1) systematic review of the literature related to the use of active modes by the elderly population; pre-processing of collected data from a questionnaire applied over a period of one year to understand the perception of comfort, safety and security related to active travel and a socio-demographic analysis; 2) statistical analysis to understand the differences among a set of attributes related to active travel applied to different ages; 3) descriptive statistics for an overview of all responses related to the importance given to each indicator, Wilcoxon Rank Sum test analysis to find out which indicators related to the perception of comfort, safety and security are more important for people above 56 years old, and the relative importance given to each indicator by this age group using the Random Forest algorithm.

This study uses the dataset obtained through an online questionnaire to understand the importance of comfort, safety, and security of people who use active modes of transport in urban areas. The dataset includes the responses from 653 participants. However, we used a sample of this questionnaire with participants above 56 years old, i.e., 18.07% of the population studied.

Several statistical analyzes were carried out to deepen the understanding of the data collected through the questionnaire. Sociodemographic data was evaluated using descriptive statistics, also the Wilcoxon Rank Sum tests were performed and the Random Forest algorithm was used to assess the relative importance attributed to each indicator within a group of people over 56 years of age.

2 Literature Review

This section includes a systematic review of the literature that was conducted to identify other research studies related to this work. This review follows the extensive review conducted in [3], but with a focus on the elderly population.

The literature search was conducted on the Scopus database, using the following queries: *TITLE-ABS-KEY* (“*active modes*” AND “*elderly*”); *TITLE-ABS-KEY* (“*active modes*” AND “*elderly*” AND “*random forest*”); and *TITLE-ABS-KEY* (“*active modes*” AND “*random forest*”). The research carried out resulted in 22 documents, some of which are not concerning this work. Thus, we highlight the most relevant ones that are presented below, which bring a comprehensive view of active modes, almost all related to the elderly. Most of the articles disregarded dealt with issues restricted to the medical field. There is an article that deals with security and presents a solution related to the infrastructure of the streets. In addition, there are two articles that are more than 10 years old, so they were also disregarded. Therefore, of the total of 22 articles, 13 articles were disregarded and 9 articles were included in this study. The second search query did not return any documents. The third search query resulted in 4 documents.

In this paper, only the two most relevant articles on transportation mean to use the Random Forest algorithm because of its relation to our study, which involves active modes in urban areas.

The authors [10] investigated walking behavior for discretionary and mandatory trips at different distances and ages. They achieved some results that reveal that people under the age of 14 are more likely to choose to walk on mandatory trips over 2400 m, those aged 25–44 years old or over 65 are less likely to choose to walk on mandatory trips with distances of 2000–2400 m and 800–1200 m, respectively. These findings are almost different on discretionary trips. Compared to other age groups, people aged 15–24 years are less likely to choose to walk on discretionary trips with 800–1200 m. In addition, in distances covered from 1200 m to 1600 m, the elderly are more likely to opt for walking compared to other age groups.

Another study [14] aimed to investigate and compare factors that affect the choice of active modes of transport by the elderly in the pre-and post-COVID-19 outbreak and evaluated changes in their active mobility behavior. The results indicate that in the post-outbreak the average duration of walking per week decreased from 59 to 29 min; while the share of this transport mode increased from 40% to 65%. Also, the proportion of bicycles and the average duration of cycling per week increased from 9% to 18% and from 9 to 15 min, respectively. In addition, travel frequency, bicycle ownership, quality of walking and cycling routes, safety at intersections, neighborhood security, vegetation, traffic calming, CBD accommodation, and accessibility of public transport have positive effects on the choice of active modes of transport by elderly; while trip distance and vehicle ownership affect negatively. The results reveal that older people have resorted to cycling on most of their long journeys during the pandemic because it is not subject to traffic restrictions.

Examples of contributions using active travel are the works of [1,5] and [19] that explored the physical activity related to the transport activity. These studies can encourage public health and transport policies so that people reach daily recommendations of physical activity using active modes. The authors [5] and [19] directly surveyed the elderly population.

Following the same bias, the works of [11] and [17] are exploratory research. The first work explored studies published up to December 2019 on the relationship between active commuting and depression among adults and older adults, suggesting that active commuting can be used as physical activity to protect against depression. The second work explores 20 articles researching studies on bicycle safety that include a description of how cycling exposure was measured, and what exposure units were used, such as distance, time, trips. Retrospective studies indicated a higher incidence of accidents for men compared to women and a higher risk of injury for cyclists aged 50 years and over. There was a lack of data for cyclists under the age of 18. The risk of bicycle accidents increased when riding in the dark. Wearing visible clothing or a helmet, or having more cycling experience did not reduce the risk of being involved in an accident. Better awareness of cyclist drivers and more interaction between car drivers and cyclists and well-maintained bicycle-specific infrastructure should improve bicycle safety.

Another contribution concerning the well-being of the elderly population is the study [12] that evaluates the fundamental linkages between subjective well-being or happiness and transport mobility-travel behavior of the elderly population, based on data from the Supplement on Disability and Use of Time for 2009, which specifically targeted senior couples with an average age of 68, using the scores to a set of satisfaction questions about life, health, memory, finances, and marriage, latent class clusters are estimated, which leads to four distinct clusters of respondents that depend on the degree of happiness in each of the satisfaction questions. The results show that respondents who engage in active modes (walking-bicycling) at the home, socialize, and enjoy better mobility also report higher levels of subjective well-being leading to a better quality of life. Additionally, the model outcomes also show that illness and pain are related to lower well-being and that quality of life in older age is correlated to mobility.

On the other hand, with a focus on the sustainable environment, the study of [8] was motivated by the promotion of low-carbon and active modes of transportation, due to the impacts of negative health and environment by the predominance of automobile dependency on North America. This study explores the potential for e-bikes to support independent mobility and active aging among the older adult population in Canada's auto-dependent context, according to a conceptual framework for older adult mobility.

They used qualitative methods to gather perceptual and experiential data from 17 community stakeholders and 37 older adults in the Region of Waterloo, Ontario. The findings highlight the importance of cycling life histories, social connection, and physical limitations to adopting cycling later in life. Specific individual and structural factors were discussed in relation to e-bike adoption including facilitators such as increased convenience, reduced physical exertion,

reduced reliance on a vehicle, and fun. Barriers included cycling infrastructure and road safety, regulation, and stigmatization barriers. E-bikes as a more convenient and supportive mode of transit for older adults are discussed alongside the importance of e-bikes as a replacement for traditional bicycles in a subset of this population.

The authors [6] define the Random Forest technique as a supervised learning algorithm. The “forest” it builds is an ensemble of independent decision trees aimed to assess the importance of the variables and those that most contributed to the model’s prediction. However, the technique loses the precision of the interpretation, as it is not possible to analyze all the generated trees, but rather a set of important variables based on them. In the end, it results in a graph of important variables showing, within all the trees analyzed, which variables stood out the most. It is in this graph of importance that we are interested in our study.

The studies of [6] and [15] use the Random Forest algorithm regarding the active modes (walking and bike). The first study aims to examine how volume traffic and speed limits affect walking trips in a medium-sized Brazilian city, São Carlos city in São Paulo state, Brazil. The second study addresses people’s willingness to go shopping by bike or kick-scooter and to transport lightweight goods in cities with low maturity for cycling and scooting applied in the two largest cities of Brazil (São Paulo and Rio de Janeiro) and Portugal (Lisbon and Porto). These researches contribute to understanding mobility behavior changes and identifying barriers that affect the use of active modes and also present some policy recommendations to encourage the use of these means of transport as more sustainable.

3 Methodology

The research methodology adopted in this study is shown in Fig. 1.

This study uses the data obtained from an online questionnaire. A process of data cleansing was performed on the responses obtained with the questionnaire to ensure that the dataset used in the study is complete and consistent.

The dataset was then used to perform a socio-demographic characterization of respondents. The socio-demographic characterization included an overview of the following features: gender, age group, educational level, nationality, and country of residence.

The descriptive statistics display the travel habits of respondents regarding two active modes of transport (walking and bicycle) for seven age groups. The descriptive statistics also portray the importance given by respondents to a set of thirteen indicators considering two main age groups: under 55 and over 56 years old.

A non-parametric statistical test comparing two paired groups, the Wilcoxon Rank Sum test, showed the most important indicators for both age groups ([0–55] and [56+]).

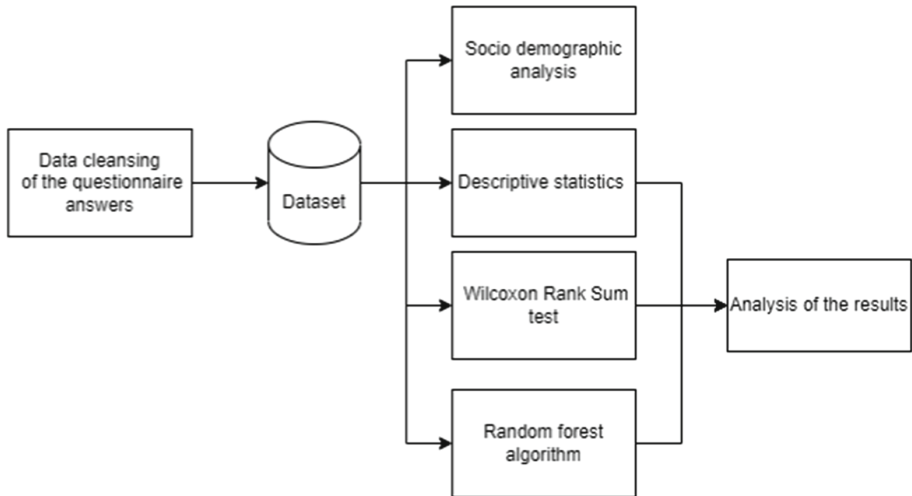


Fig. 1. Overview of the methodology adopted in this study.

Next, the random forest algorithm was applied to the dataset for the same purpose as the previous test, ranking the importance of the thirteen indicators. The random forest analysis considered the same age groups as the previous analyses for the same indicators (i.e., under 55 and over 56). For each age group, the random forest algorithm returned the relative importance of the thirteen indicators (thus ranking the indicators from most important to least important).

The analysis of results aimed to extract the main findings from the previous steps, namely regarding the identification of the perceived importance of each indicator by each age group related to the research questions.

4 Data

The data set used in this study was gathered from an online survey, conducted between August 2021 and August 2022. The questionnaire included a set of questions to provide the socio-demographic context of respondents. These include age range, nationality, country of residence, gender, educational level, employment situation, and the number of children.

The questionnaire continued by asking respondents to rate the importance they attribute to a set of thirteen indicators considering their personal experience when using active modes of transport. To classify the importance of each indicator, the respondents used a Likert scale, where 1 referred to not important and 5 to very important. Table 1 shows the set of indicators organized in the following dimensions: Distance & Time, Comfort, and Safety & Security. The identification of this set of indicators and dimensions follows the work published in [2], which evolved with further studies and literature review.

Table 1. Indicators used in the questionnaire organized by dimension.

Dimension	Indicators
Distance & time	Adequate Travel Distance & Time
Comfort	Absence of Allergenic Air Quality Adequate Thermal Sensation Adequate Noise Level Adequate Crowd Density Existence of Commercial Areas Existence of Green Areas
Safety & security	Adequate Speed Limit of the Street Adequate Street Visual Appearance Adequate Surveillance Level Adequate Traffic Volume Good Street Illumination Level

The questionnaire had a total of 660 responses, of which 7 responses were discarded due to missing values and inconsistency. Therefore, a total of 653 responses were considered in this study.

Regarding gender, 51.91% of respondents identified as female, 47.93% as male, and 0.15% as other. Moreover, 55.59% of the respondents had no children and 44.41% of the respondents had children.

Table 2. Number and proportion of respondents by age group.

Age Group	No.	%	Age Group	No.	%
[0–17]	32	4.90	[0–55]	535	81.93
[18–25]	140	21.44			
[26–35]	106	16.23			
[36–45]	136	20.83			
[46–55]	121	18.53			
[56–65]	78	11.94	[56+]	118	18.07
[66+]	40	6.13			

Table 2 shows the number and proportion of responses for each age group. Accordingly, 4.90% of respondents had less than 18 years old, 21.44% had between 18 and 25 years old, 16.23% had between 26 and 35 years old, 20.83% had between 36 and 45 years old, 18.53% had between 46 and 55 years old, 11.94% had between 56 and 65 years old, and 6.13% had more than 65 years old.

Moreover, in order to investigate the perception of the elderly when using active modes of transport, we performed statistical analyses comparing the following two main age groups: the age group [0–55] included respondents up to 55 years old, and the age group [56+] included respondents over 56 years old (both obtained by aggregating the corresponding data). The number and proportion of respondents in these two categories is also displayed in Table 2.

Table 3. Number and proportion of respondents by the degree of education.

Education	[0–55]		[56+]		Total	
	No.	%	No.	%	No.	%
1st cycle of basic education (4th year)	0	0.00	2	0.31	2	0.31
2nd cycle of basic education (6th year)	5	0.77	0	0.00	5	0.77
3rd cycle of basic education (9th year)	24	3.68	1	0.15	25	3.83
Secondary education (12th year)	92	14.09	11	1.68	103	15.77
Lic./bachelor’s degree	188	28.79	46	7.04	234	35.83
Master’s degree	142	21.75	23	3.52	165	25.27
Doctorate degree	73	11.18	29	4.44	102	15.62
Other	11	1.68	6	0.92	17	2.60

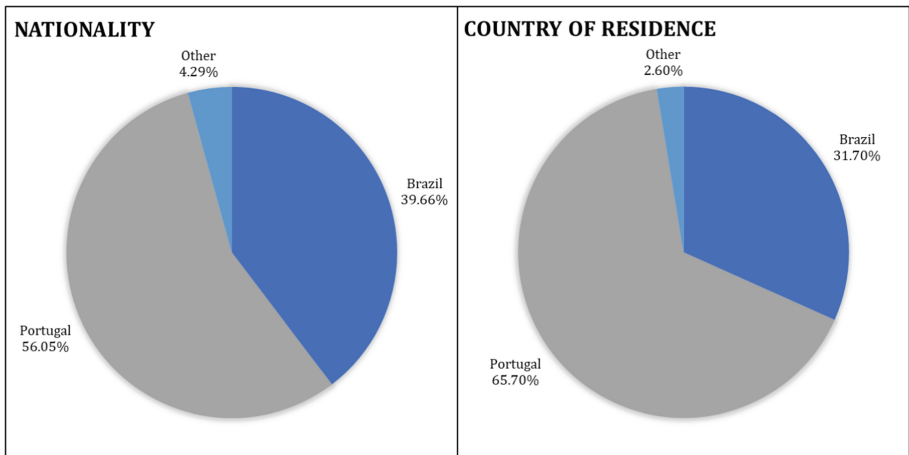


Fig. 2. Number and proportion of responses regarding nationality (left) and country of residence (right).

Table 3 shows the number and proportion of respondents with each education level for the age group [0–55] in columns 2 and 3, for the age group [56+] in columns 4 and 5, and for the total of respondents in columns 6 and 7. The number of respondents with 2nd cycle of basic education or less was almost residual, around 1%. Respondents with at least the 3rd cycle of basic education accounted

for 3.83%, while respondents with at least the 12th year of education accounted for 15.77%. Furthermore, 35.83% of respondents had at least a bachelor’s degree, 25.27% a master’s degree, and 15.62% a doctorate degree.

Figure 2 shows the number and proportion of respondents regarding their nationality and country of residence. Accordingly, 56.05% of respondents had Portuguese nationality, 39.66% had Brazilian nationality and 4.29% had other nationalities. Regarding country of residence, 65.70% of respondents lived in Portugal, 31.70% in Brazil, and 2.60% in other countries.

5 Results and Discussion

5.1 Descriptive Statistics

Figure 3 shows the proportion of people who walked more than 2 km per day in each age group. Similar proportions were obtained for the age groups [0–17], [18–25], [56–65], and [66+], with 43.75%, 45.71%, 46.15%, and 45.00%, respectively. The proportion of respondents walking at least 2 km per day in age groups [26–35], [36–45], and [46–55] was lower than in the other age groups, with 30.19%, 28.68% and 34.71%, respectively.

Figure 4 shows, for each age group, the proportion of respondents who cycle more than 2 km per day. The age groups with the highest proportion of respondents were [36–45] and [46–55], with 28.68% e 36.36% respectively. Older age groups showed lower proportions: the age group [56–65] had a proportion of 17.95%, and the age group [66+] had a proportion of 7.50%. The remaining age groups showed the following proportions: age group [0–17] with 25.00%, age group [18–25] with 13.57%, and age group [26–35] with 11.32%.

The proportion of respondents who cycle at least 2km per day (Fig. 4) was lower than the proportion of respondents who walk at least 2 km per day (Fig. 3) for age groups [0–17], [18–25], [26–35], [56–65], and [66+]. While for age groups [36–45] and [46–55], this comparison returned similar values.

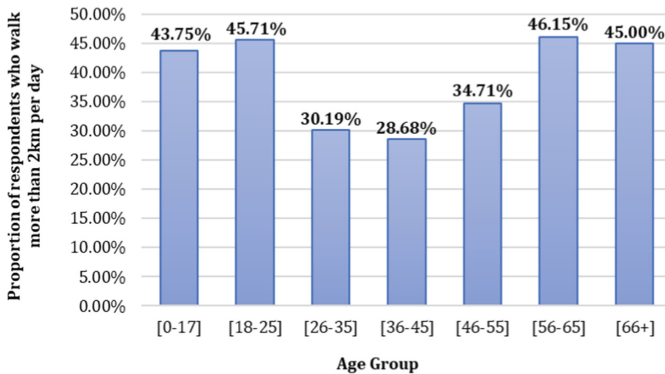


Fig. 3. Proportion of respondents in each age group who walk more than 2 km per day.

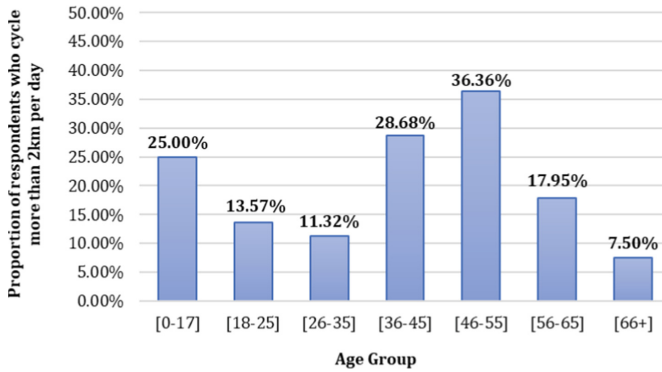


Fig. 4. Proportion of respondents in each age group who cycle more than 2km per day.

Figure 5 and Fig. 6 show, for age groups [0–55] and [56+] respectively, the number of respondents who rated each indicator in each level of the Likert scale (varying from 1 not important to 5 very important). These figures allow us to visualize the distribution of responses obtained.

Considering only the very important answers in the descriptive statistics for the [0–55] group, the set of people evaluated gives more importance to good street illumination of the street, adequate surveillance level, adequate traffic volume, adequate travel distance & time, air quality, adequate speed limit on the street, existence of green areas, adequate noise level, adequate street visual appearance, adequate crowd density, adequate thermal sensation, absence allergenic, existence of commercial areas, in this order. Next, applying the same analysis to the [56+] group, the set of people evaluated gives more importance to good street illumination of the street, adequate traffic volume, existence of green areas, surveillance level, air quality, adequate speed limit of the street, distance & time, adequate street visual appearance, adequate noise level, adequate thermal sensation, absence of allergenic, adequate crowd density, existence of commercial areas indicators, in this order.

However, this analysis does not consider all the answers on a scale between 1 (not important) and 5 (very important).

Therefore, the Wilcoxon Rank Sum test and the Random Forest algorithm described in the following sections solve this problem, because these analyses consider all responses to establish an importance ranking.

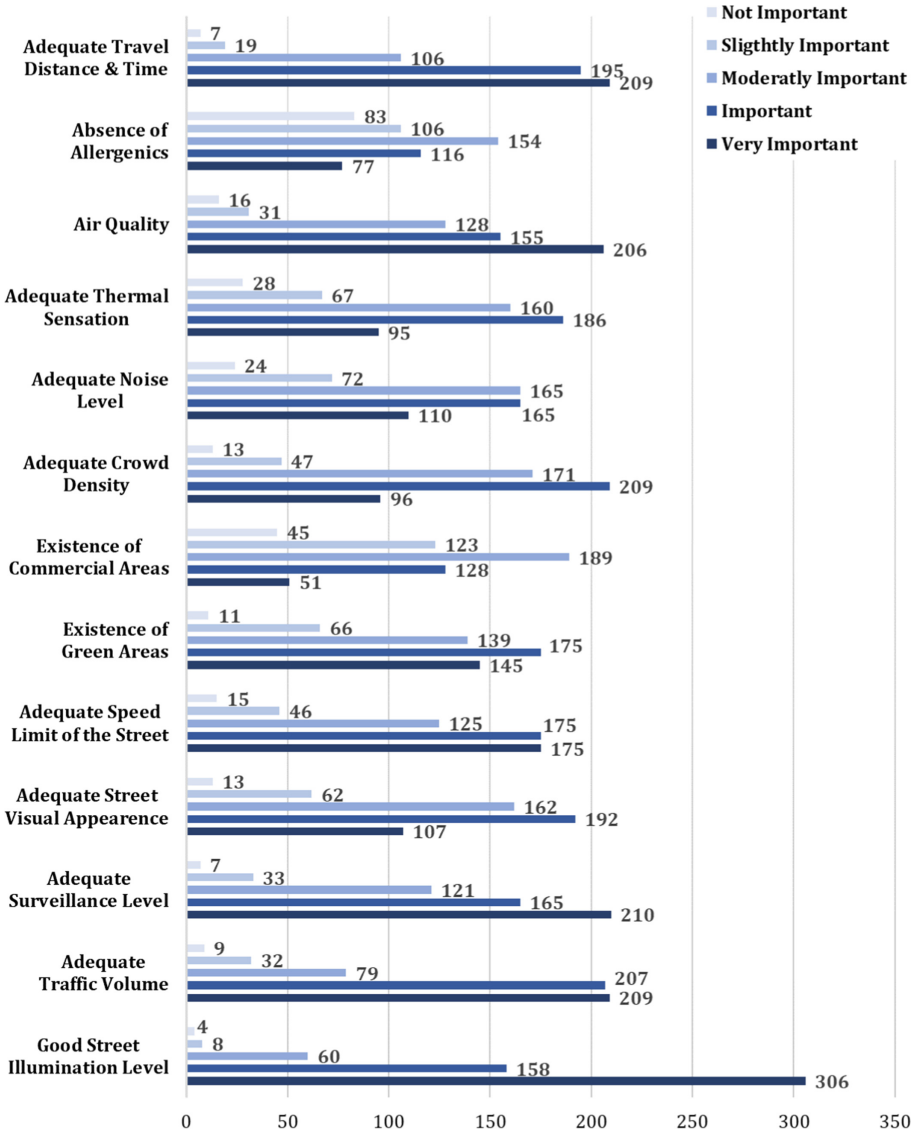


Fig. 5. Number of respondents in age group [0-55] who rated each indicator in each level of the Likert scale.

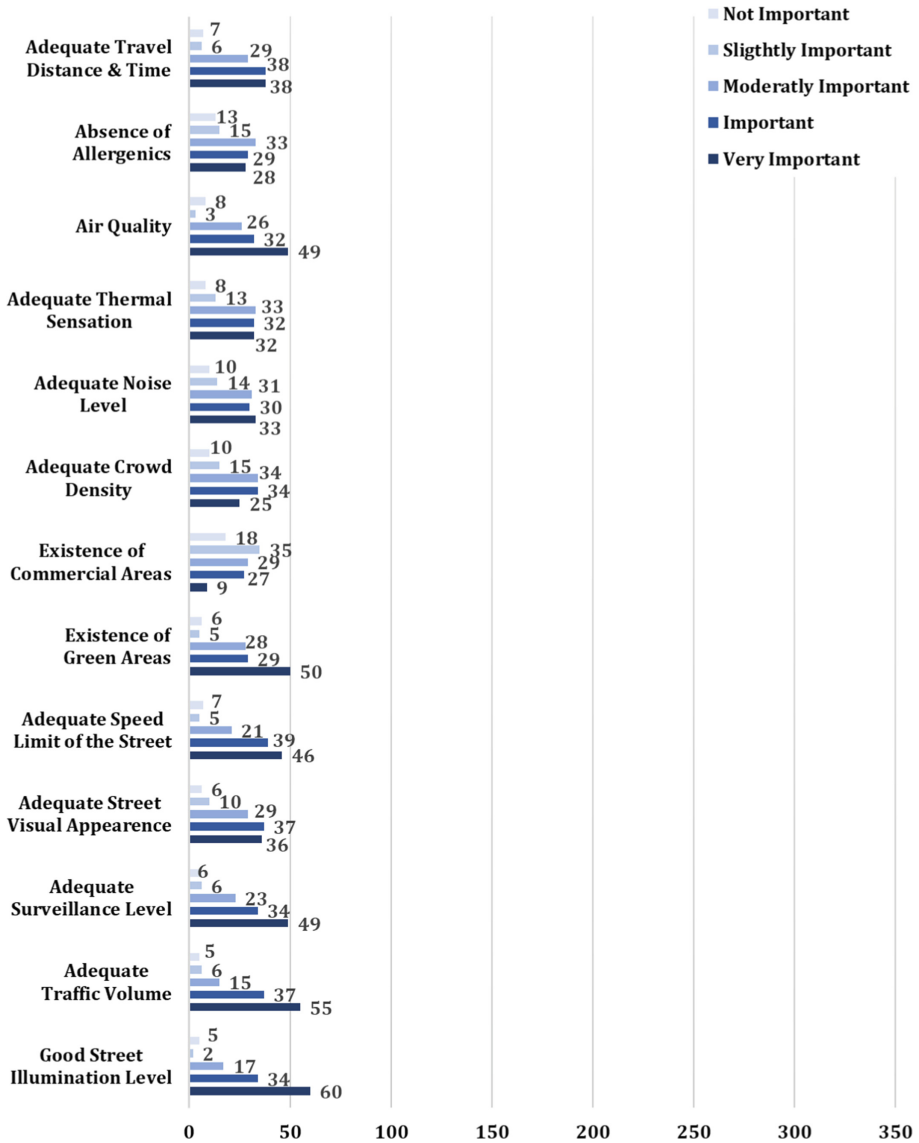


Fig. 6. Number of respondents in age group [56+] who rated each indicator in each level of the Likert scale.

5.2 Wilcoxon Rank Sum Test for Independent Samples

In this section, we compare whether the importance attributed to each indicator is different in age groups [0–55] and [56+], considering a statistical significance of 5%. To this end, we performed the Wilcoxon Rank Sum test for independent samples. This statistical test is adequate to compare two populations whose

samples are independent (i.e., they are not paired), from ordinal data. The null hypothesis H0 is that the two population locations are the same, and the alternative hypothesis H1 is that the location of population A is different from the location of population B (two-tail test) [7, p. 584]. The results are summarized in Table 4.

Table 4. Comparing the importance given by age groups [0–55] and [56+] to each indicator using the Wilcoxon Rank Sum test for independent samples.

Indicator	W statistic	p-value
Adequate Travel Distance & Time	35655	0.020
Absence of Allergenic	26256	0.003
Air Quality	30854	0.687
Adequate Thermal Sensation	29692	0.295
Adequate Noise Level	30475	0.543
Adequate Crowd Density	34006	0.168
Existence of Commercial Areas	35446	0.030
Existence of Green Areas	26824	0.008
Adequate Speed Limit of the Street	29062	0.158
Adequate Street Visual Appearance	28454	0.080
Adequate Surveillance Level	31283	0.873
Adequate Traffic Volume	29822	0.316
Good Street Illumination Level	34306	0.098

The results showed that there was evidence at the 5% significance level to establish that the two age groups attribute different importance to the following indicators: *Adequate Travel Distance & Time*, *Absence of Allergenic*, *Existence of Commercial Areas*, and *Existence of Green Areas*. These are the cases where we can reject the null hypothesis of equal medians comparing the two age groups.

Also with a statistical significance of 5%, we investigated the age group attributing more importance to each one of these four indicators, using the single-tailed results of the same statistic test. The results showed that: i) indicators *Adequate Travel Distance & Time* and *Existence of Commercial Areas* were given more importance by age group [0–55], with p-values of 0.010 and 0.015, respectively; ii) indicators *Absence of Allergenic* and *Existence of Green Areas* were given more importance by age group [56+], with p-values of 0.002 and 0.004 respectively.

5.3 Random Forest

The Random Forest method works by assuming that each feature is a root node of a decision tree, and the set of features forms the forest. In our case, each

feature is an indicator, the algorithm calculates the relative importance of each feature as a function of the answer given by the survey participants returning a vector with this importance as graphics shown in the figures below.

The application of the Random Forest algorithm to the age group [0–55] highlighted the relative importance given by people to indicators: adequate thermal sensation, absence of allergenic, adequate crowd density, an adequate speed limit of the street, adequate traffic volume, adequate noise level, adequate street visual appearance, existence of commercial areas, adequate travel distance & time, adequate surveillance level, air quality, existence of green areas, and good street illumination in this order, as shown in Fig. 7. In this analysis, there were no indicators with zero relative importance.

Furthermore, the algorithm returned a relative importance of the different indicators for the age group [56+] in the following descending order: air quality, adequate travel distance & time, adequate crowd density, adequate thermal sensation, absence of allergenic, good street illumination level, adequate travel volume, and adequate noise level. These results are shown in Fig. 8.

Additionally, in the analysis for the age group [56+], the following indicators returned zero relative importance: existence of commercial areas, existence of green areas, adequate speed limit of the street, adequate street visual appearance, and adequate surveillance level.

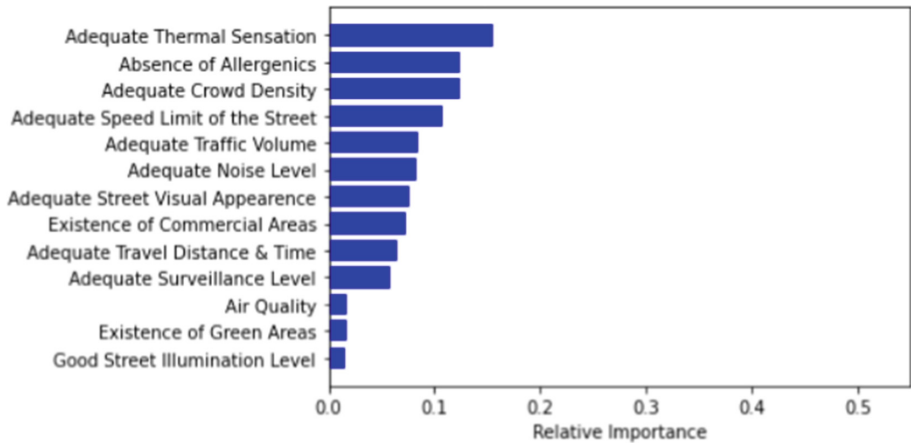


Fig. 7. Relative importance for the different indicators obtained with the Random Forest algorithm in age group [0–55].

It is noted that within the age group [56+], the descriptive statistics presented an emphasis important on the safety & security dimensions considering only the answers “very important”, but this analysis is incomplete by difficult to compare using a scale of importance to each indicator. On the other hand, the results of the Random Forest algorithm showed a relative importance ranking

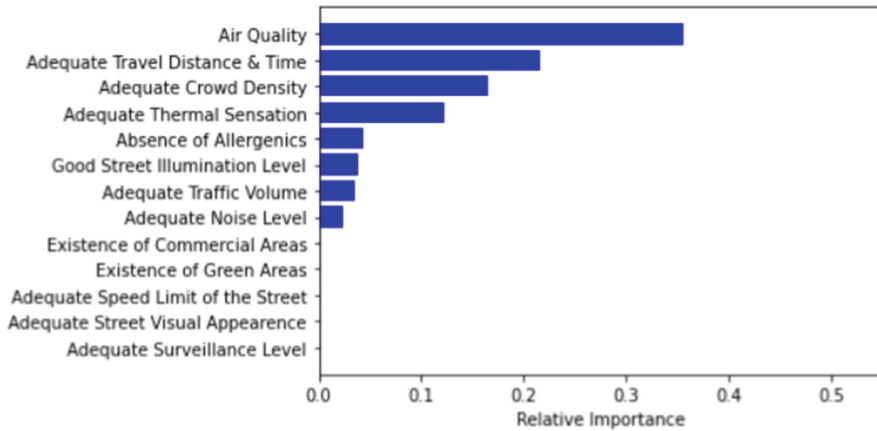


Fig. 8. Relative importance for the different indicators obtained with the Random Forest algorithm in age group [56+].

easier to compare that includes the indicators of the comfort dimension as air quality, adequate crowd density, adequate thermal sensation, absence of allergenic, and adequate noise level, while the safety & security dimension stand out good street illumination level and adequate traffic volume, besides of distance & time dimension. Therefore, these analyzes revealed that in this [56+] group the comfort dimensions stand out.

In this study, the indicators that stand out in both analyzes can be deepened in future works, as well as those that were not so satisfactory. In addition, the context in which these groups of people are included as their residences must be considered, as the environment in which they live influences these results. For example, there are cities or countries where the safety & security dimension is more important, while others where comfort is more important.

6 Conclusion and Future Work

There is a growing encouragement to use active modes of transport such as cycling and walking, as a way to promote sustainability, as well as increased health and well-being for all ages.

Our contribution is to bring more analyses within this group of people above 56 years old to know their preferences regarding the active modes and the importance given to each indicator of comfort and safety & security dimensions because the literature review showed that there are few works that treat this subject to this set of people.

In this study, we analyzed the responses to an online questionnaire conducted between August 2021 and August 2022 to understand the preferences in active modes of different age groups. Respondents were asked a set of socio-demographic questions (i.e., age range, nationality, country of residence, gender,

educational level, employment situation, and the number of children), and to rate the importance they attributed to a set of thirteen indicators.

The set of indicators was organized into three dimensions: i) the *Distance & Time* dimension (including Adequate Travel Distance & Time); ii) the *Comfort* dimension (including Absence of Allergenic, Air quality, Adequate Thermal Sensation, Adequate Noise Level, Adequate Crowd Density, Existence of Commercial Areas, and Existence of Green Areas); iii) the *Safety & Security* dimension (including Adequate Speed Limit of the Street, Adequate Street Visual Appearance, Adequate Surveillance Level, Adequate Traffic Volume, and Good Street Illumination Level).

The two main age groups considered for this analysis were: [0–55] including all respondents 55 years old or less, and [56+] encompassing all respondents 56 years old or more.

We applied descriptive statistics to the questionnaire responses to provide a sociodemographic characterization of the respondents, as well as show an overview of the responses for each indicator.

To address the first research question (i.e., What indicators related to the perception of comfort, safety, and security are more important for people above 56 years old?) we applied the Wilcoxon Rank Sum test for independent samples, considering the comparison of the two age groups under analysis. The results showed that: i) the indicators *Adequate Travel Distance & Time* and *Existence of Commercial Areas* were perceived as having more importance for the [0–55] age group than the [56+] age group; ii) the indicators *Absence of Allergenic* and *Existence of Green Areas* were perceived as having more importance for the [56+] age group than the [0–55] age group.

To address the second research question (i.e., What is the relative importance attributed to the indicators on the use of active modes by the age group over 56 years old?) we applied the random forest algorithm to the answers in each age group and compared the results obtained. The results of the Random Forest algorithm for the age group [56+] returned the following relative importance of the indicators (sorted from most important to least important): 1) air quality, 2) adequate travel distance & time, 3) adequate crowd density, 4) adequate thermal sensation, 5) absence of allergenic, 6) good street illumination level, 7) adequate traffic volume, and 8) adequate noise level.

Our suggestion for future work is more studies using active modes for people above 56 years old investigating more the indicators that stand out in this work to encourage more people the use active modes and public politics directed toward the improvement of infrastructure and get along with other means of transport promoting cities more sustainable.

Additionally, future work could include studying the differences in the importance of these indicators with respect to the country of residence.

Acknowledgements. This paper is a result of the project Safe Cities - Inovação para Construir Cidades Seguras, with the reference POCI-01-0247-FEDER-041435, co-funded by the European Regional Development Fund (ERDF), through the Operational Programme for Competitiveness and Internationalization (COMPETE 2020), under the PORTUGAL 2020 Partnership Agreement.

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