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Senior Tourists' Perceptions of Tactile Paving at Bus Stops and in the Surrounding Environment: Lessons Learned from Project ACCES4ALL

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ABSTRACT

Universal design regarding accessibility to public transport is fundamental to increase the independence of the elderly and people with disabilities. This can be achieved by developing pedestrian infrastructures that provide safe/secure spaces for walking, modal interfaces and transport waiting areas. Tactile paving surfaces have been implemented to guide and inform people with visual impairments about the infrastructure they are using, which increase their autonomy, mobility, confidence, and safety. This research aims to analyse the perspective of elderly tourists regarding tactile pavements. A questionnaire was developed for senior tourists (60+ years old) about their mobility and perceptions of bus stop environments in the countries where they reside. Findings indicate a decrease in the perceived importance of tactile pavement in elderly tourists (aged 80+), female tourists, and older tourists with disabilities. The use of tactile paving surfaces is essential; however, it is important to minimize any adverse impact or discomfort of these surfaces. Warnings on pavements and guide patterns should be constructed of truncated cones and flat-topped elongated bars, respectively, and the height of the pavement cannot be greater than 4 mm. Installations must have correct/simple configurations and be regularly maintained. Findings will influence the design of an age-friendly bus stop.

1. INTRODUCTION

Even though disability is a part of the human condition, particularly for elderly people, access to health care, education, employment and leisure activities are not always available to this demographic, according to the World Health Survey. The prevalence of people aged 60 years and over that suffers from a disability is 43.4%, in low-income countries, and 29.5%, in high-income countries [1].

In Portugal, for instance, 56% of people over 65 years of age have at least one disability (e.g. cannot walk properly or climb stairs) [2, 3]. As life-span increases and people live longer lives, society should find better ways to include and contribute to the quality of life of the elderly and people with disabilities.

One of the most common difficulties associated with age is mobility. Mobility, specifically reduced mobility, has become an important global issue that needs to be addressed allowing people with disabilities to engage in social activities [4]. Hence, it is important to have places and laws that promote inclusion in urban and rural territories, for instance, access to public transportation that does not exclude people with disabilities.

Universal accessibility was created to bridge that gap by improving accessibility and social inclusion for all in many areas, including transportation. Related to this notion is the concept of "sustainable mobility" intended to develop an integrated approach that covers all modes of transport, including walking, and is designed for all people despite their level of functionality [5]. This approach focuses on human needs and expectations; it is understood as emergent human-centred mobility that must be integrated in urban and transportation design. This is consensual with the social dimension of sustainability that considers specific objectives alluding to social equity, equal opportunities in the access of goods and services, and the active participation of all citizens in society, for example social inclusion. The traditional car-oriented approach promotes a systematic exclusion of many people who cannot drive (e.g. older people, people with disabilities) or have no access to this expensive means of transportation.

All around the world, governments and institutions are considering universal accessibility as a way of improving society. The "Convention on the Rights of People with Disabilities" [6], helped to dictate the need for improvements by promoting and ensuring the rights and dignity of people with impairments (e.g. physical, mental, intellectual or sensory disabilities). This convention seeks to empower people with disabilities to live autonomously and fully participate in society by guaranteeing, among other things, equal accessibility to transportation, the physical environment, information, communications, technology, culture and leisure [6], which includes tourism.

To promote this equality of rights, a change is necessary in the way modern society presents itself, by starting to focus on overall spaces that can be useful for all people in relation to their difficulties, and this is where universal design arises. The definition of universal design is: ''The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design'' [7]. More recently programs and services were integrated into this concept and do not exclude assistive devices, where necessary, for particular groups of people with disabilities [8].

Universal design is perfect for the inclusion within society of people with disabilities by creating spaces they can use fully, and also by being accessible to anyone. For instance, accessible stops for various modes of transport are necessary for people with motor disabilities, and are useful for people with prams or baggage [4, 9].

Accessible tourism is a new concept that considers the development of tourism activities for all, given the needs of people with disabilities, such as blind people or people with impaired vision. An important subject for improvement regarding this matter is the accessibility to transport; from a tourist perspective, this can be achieved through an urban renewal that makes pedestrian infrastructures more accessible (e.g. for people in wheelchairs), so they may have access to places of culture and leisure; and from a community perspective, access to places of employment, more social participation, respect, and social inclusion [5].

To accomplish this goal (i.e. accessibility to all people), it is necessary to collect information regarding the current conditions of urban accessibility and its long term maintenance to create a good design to enhance people's mobility [10]. Therefore, access to transport and its facilities should be as easy as possible for people with impairments. Namely, there should be simple access to all transport services and terminals (e.g. the facilities should be at the same level, have ramps, elevators or platform lifts); transport information must attend to the needs of people with sensory disabilities (e.g. be in visual and acoustic formats), should take into account environmental noise, lighting and colour contrast between urban furniture and the environment, as well the availability of other modes of communication (e.g. websites or applications for mobile devices). Pedestrian crossings should implement traffic lights with audible and visual signals so that people with visual or hearing difficulties are able to cross them securely [8].

In a world where public transportation is foremost in the fight against pollution and other problems, it is imperative to have easy access to collective transport (e.g. bus, train, boat) and consequently to their facilities, since this allows for the ability to travel varying distances, access goods and different opportunities, that otherwise would not be possible, resulting in increased autonomy and better social inclusion [11].

Even though access to transport is fundamental to increasing people's independence, the universal accessibility of a bus stop environment or other transport facilities, is fundamental to allowing direct access to transport, taking into account the type and condition of the sidewalks and pedestrian crossings [5]. Therefore, a level, paved and non-slip surfaced area that provides a safe and secure space for people to wait for a vehicle, whilst distanced from the curb and traffic, is essential for people with disabilities. This will also allow space for wheelchair users, the elderly, and others (e.g. parents with strollers) [12]. As such, not only is the construction of street modifications (e.g. building an adequate ramp) important to assist people with disabilities to be more active and social, but also the effective design and maintenance of the surrounding outdoor materials is a necessity.

A study conducted by Newton et al. [13], regarding the preferences of 200 people (65+ years old) on a range of street attributes, showed that the specific component material of a street (e.g. adequate seating and smooth pavements) may encourage a person's decision to go out and be more social, depending on their sense of safety.

Other studies demonstrated that people recognized strip planting within green urban infrastructures, as the most relevant design component that could enhance satisfaction levels and increase willingness to walk, while the existence of driveways and the number of vehicle lanes as a design element, reduces their satisfaction [14]. Therefore, a good and accessible universal design approach in pedestrian infrastructures and modal interfaces is essential to encourage elderly people, and people with disabilities, to be more social and go out more, which may in turn enhance their security and quality of life.

Another fundamental material used in universal design is tactile paving. Tactile paving is characterized as surfaces that have texture, contrasting colour, and are perceptible and identifiable underfoot and by using a cane, or through residual functional vision. This flooring is designed to guide and inform people with visual impairments about their surroundings, to increase their autonomy, mobility, confidence, and safety when walking outside on the street.

European countries have quite different tactile paving surface solutions, although they use similar language elements. Common indicator elements are corduroy flooring, alert flooring (button) and smooth/soft flooring.

Tactile paving surfaces are used on pedestrian crossings with dropped kerbs to provide essential information to blind and partially sighted people to find and navigate the crossing (Figure 1). These floorings guarantee confidence to walk independently and safely wherever they are. When the road is raised to the level of the sidewalk, blind pedestrians need this tactile information to understand where the border between the road and the walkway is.

At bus stops, technical solutions for the accessibility of visually impaired people, specifically with regard to the use of tactile and/or colour-differentiated floors, differ widely all over the world, mainly in the composition of the different elements they are composed of (Figure 2). Sometimes there is a tactile warning strip on the waiting platform parallel to the kerb, and in some situations there is tactile pavement in the boarding area.

(a) Pedestrian crossing in Sweden

(b) Pedestrian crossing in England

Figure 1. Examples of different tactile solutions and colour contrast on pedestrian crossings within Europe (Source: [15])

(a) Bus stop in Sweden (b) Bus stop in Spain (c) Bus stop in Ireland

Figure 2. Examples of tactile/chromatic solutions at bus stops within Europe (Source: [15])

In some countries tactile paving surfaces are not used because this kind of information can be misinterpreted by blind people and generate danger situations. Furthermore, tactile paving surfaces are being investigated because there is some criticism of their use by people with motor difficulties, specifically older people [16], since elderly with specific medical conditions, such as diabetes, may have reduced sensitivity in their feet [17]. On the other hand, previously developed studies about the perceptions of elderly people in the outdoor environment expressed concerns about falling or feeling unstable on tactile surfaces mainly on dropped kerbs [16].

In fact, the neighbouring environment contributes to the fear of falling among seniors, who have a degree of anxiety about falling [18]. The built environment, through uneven sidewalks, cobble stones, slippery surfaces, sloped kerbs and/or covered with metal, contributes to a perceived fall risk and fear of falling by the elderly [19].

In 1998, in the United Kingdom, the Department for Transport produced the official guidelines "Guidance on the Use of Tactile Paving Surfaces" to assist streetscape designers and town planners in their work. In this document it is recognised that the needs of people with physical and sensory disabilities could create potential conflict, so the proposal of tactile paving surfaces involved not only the target group, i.e. visually impaired people, but also others with a wide range of other disabilities including wheelchair users and people with walking difficulties.

For path surface guidance, the use of colour and texture can assist blind and partially sighted people and it is important that textures warning of potential hazards (e.g. road crossing, staircase) are rigid enough to be detectable by most people but without constituting a trip hazard or causing extreme discomfort [17].

This paper describes some of the results of the project ACCES4ALL – Accessibility for all in tourism. This research focuses on bus stops as an example of modal interfaces, designed according to the concepts of “Universal Design” and "Age Sensitive Design". Its main objective is to develop a pilot study of an accessible, smart and sustainable bus stop to be located at Faro International Airport, in Algarve, Portugal.

Considering the importance of an age friendly paving surface on the waiting area of this bus stop, to increase social inclusion, this paper aims to analyse the perspective of elderly tourists at Faro Airport concerning tactile pavements. The analysis will compare these perceptions by age, gender and by tourist elderly with disabilities.

2. METHODS

2.1 Methodological approach

The methodological approach considered three phases: (1) development of a questionnaire; (2) realization of the survey at Faro Airport; (3) statistical analysis, interpretation of findings and reporting (Figure 3)

A previous questionnaire was developed by the research team considering four sets of questions: information about the respondent; characterization of their mobility where they live and in the Algarve region (as tourists); information on the perception of universal accessibility conditions in bus stop environments; use of information and communication systems and technologies.

The first version of the questionnaire was reviewed by students of civil engineering and tourism at the University of Algarve, who interviewed their elderly family members. The research team then made their contribution.

In April 2018, the draft questionnaire was piloted by a tourism student involved in the Project, and questioned 51 departing passengers at Faro Airport. In this phase, it was possible to review and validate a few questions in the questionnaire. The input received during this phase has helped the team to refine some of the questions and choose specific photographs to show participants to aid understanding of the criteria.

At Faro Airport, tourists mainly come from the United Kingdom, Germany, Ireland, Spain, France, and Belgium. These developed countries are known for their public policies on mobility inclusion, have good quality transport systems and, in general, the built environment is accessible for all. So, the focus of the study was to understand the perceptions of people from those European countries.

The final survey was developed for foreign elderly tourists aged 60 or over. In August and September 2018, inquiries were conducted randomly by professional inquirers at Faro International Airport, mainly in waiting areas before departure. During the survey the interviewers used photographs to explain technical aspects to elderly tourists.

Data was introduced into an electronic file and advanced statistical analysis was used.

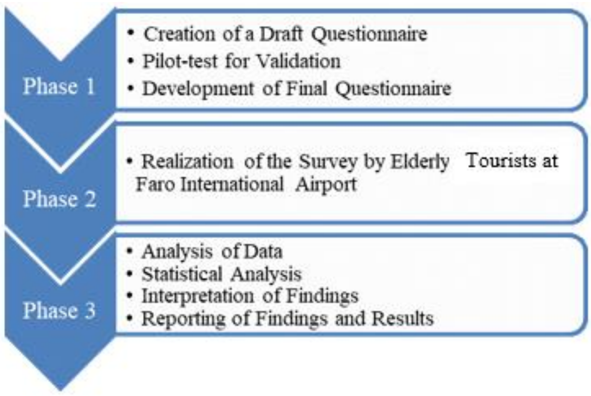

Figure 3. Diagram of the methodological approach

2.2 Questionnaire development

The questionnaire aimed to identify the functional diversity of different groups of older people, and to understand if their mobility, perceptions and digital literacy are significantly different, according to their functional diversity and age. The results of this questionnaire will influence the design process of an age-friendly bus stop.

The section of the questionnaire concerning the daily mobility of senior citizens and the perceived criteria of bus stop environments was developed based on previous research by the team and a literature review.

A questionnaire for senior tourists was subsequently developed containing 28 questions filling four pages. Senior tourists will be potential users of the future accessible bus stop to be located at Faro International Airport.

The questionnaire included mainly closed questions eliciting quantitative data, and nine open questions offering the opportunity to use their own words generating qualitative response information.

The questions were divided into four categories: information about the respondent; characterization of their daily mobility, including in the Algarve region (as tourists); information on the perception of universal accessibility conditions in bus stop environments; and their use of communication and information systems and technologies.

The section regarding general information about the respondents contained questions on gender, age group, level of education, professional or employment status, country of residence and nationality, if they live in a city, disabilities that affect their mobility (e.g. motor problems, visual problems, hearing problems, orientation problems, other open-question), the use of technical aids (assistive devices) and factors limiting the use of public transport. The respondents could disclose the name of the city where they live, the disability that affects their mobility, the use of more than one technical aid and the factors limiting the use of public transport, filling in "other" as issues not listed (open question).

The section regarding the perception of the conditions for universal accessibility at bus stops in their countries contained questions about the surrounding environment of bus stops and bus stop elements. Questions directly addressed universal accessibility parameters of this built environment. The scales ranged from 1 to 4, where 1 meant "Strongly agree" and 4 meant "Strongly Disagree." A neutral response was avoided to force respondents to make a choice in a specific direction. Not providing a neutral alternative significantly improves both reliability and validity [20]. Afterwards, participants were asked the importance of each parameter for their accessibility needs with response alternatives "yes" and "no".

At the beginning of the inquiry, the main goal of the research was revealed and it was specified that the survey was confidential and anonymous, so no names and addresses were requested. At the end, the email of the main researcher of the project was given for people interested in learning about the results of this study.

Concerning the section on perceptions regarding the conditions for universal accessibility at bus stops in their countries, the starting point of the project was to list those technical parameters associated with accessible bus stops, and their surroundings, from the viewpoint of people with disabilities, in a context of inclusive mobility. It considered urban aspects, specific pavement and surface materials, information and communication for all and adapted urban furniture along the surrounding environment of the bus stop and at the bus stop itself. Then perceived criteria were developed to help the evaluation of bus stop environments in a way that is understandable to senior citizens.

2.3 Data collection at Faro International Airport

The purpose of this study was to make comparisons across different age groups of older people as well as between people with and without disabilities (motor problems, visual problems, hearing problems, orientation problems, and others) that affect their mobility.

Usually, older people as a group are considered in the universal design of buildings, public spaces, and products. This approach considers the needs of people with functional diversity. The aim was to identify the functional diversity of older people and understand if their perceptions are significantly different according to their functional diversity.

The method chosen to collect data from senior tourists was self-administered questionnaires using paper-and-pencil, with the support of inquirers who clarified doubts and showed photographs depicting what was being asked (e.g. raised platform, type of benches, QR codes, NFC technology).

In April, August and September of 2018, inquiries were conducted randomly at Faro International Airport, mainly on the waiting area before departure. In April, they were conducted by a tourist student, and in the other months by professional inquirers.

A convenience sampling method was used, in which the participants were randomly selected. Senior tourists from diverse geographical contexts were approached and asked to participate in the study. After their acceptance, a printed version of the inquiry was given to them.

2.4 Sampling procedure

The purpose of sampling in this project was to make comparisons across age groups of senior tourists from 60-64 years old, 65-69, 70-74, 75-79, 80-84, 85-89, older than or equal to 90, as well as senior tourists with functional diversity, such as with or without disabilities that affect their mobility (e.g., motor, vision, hearing, orientation problems, and others). For the size of the sample, it was considered that about 100 participants in each age group were representative to guarantee conclusions.

The number of elderly tourists visiting Portugal using Faro Airport is high, according to data given by VINCI Airports/ANA Aeroportos de Portugal. In the summer of 2018, 7% of passengers were over 60 years old. In August of that year, 1.156.279 passengers were registered of whom 80.940 were elderly, and in September 1.090.104 passengers of whom 76.307 were elderly.

In this survey with a population size of 157.247, for a 95% confidence level and an approximately 3.4% degree of accuracy (percentage of maximum error required) a sample size of inquiries equal to 851 was achieved.

2.5 Statistical analysis

Data was introduced into an electronic file and the statistical analysis capabilities of Statistical Product and Service Solutions (SPSS, v. 25) was used.

Because of the low frequency of participants who were 90+ years old, 85+ year old participants were grouped.

Descriptive statistics of the frequency of each answer were created, characterizing elderly tourists by gender, age and mobility capacity. Three questions regarding the perceived importance of tactile pavement at bus waiting areas were selected for further analysis. A bar graph representing the perceived importance of tactile pavement by age group was created with error bars representing a 95% confidence interval. Inferential statistics were performed to determine if there was a significant decrease in the perceived importance of tactile pavement by elderly people. A chi-square test of independence was performed to assess the statistical significance of this relationship. The same analysis was performed for gender and disability.

3. RESULTS

It was concluded that there was a decrease in the perceived importance of tactile pavement by elderly tourists, in particular for tourists who were 80 years old or older (Figure 4).

Older tourists perceived pedestrian crossings with dropped kerbs and tactile paving as less important [$\chi^2(5) = 91.913$, $p < 0.001$] as well as tactile pavement in the boarding area [$\chi^2(5) = 105.697$, $p < 0.001$], and tactile warning strips parallel to the kerb [$\chi^2(5) = 118.488$, $p < 0.001$].

It was concluded that female tourists perceived tactile pavement as less important than males (Figure 5). Women perceived pedestrian crossings with ramps with tactile paving as less important [$\chi^2(1) = 12.626$, $p <0.001$], as well as tactile pavement on the boarding area [$\chi^2(1) = 21.107$, $p <0.001$], and tactile warning strips on the waiting platform [$\chi^2(1) = 17.488$, $p <0.001$].

It was concluded that tourists with a disability that affects their mobility perceived tactile pavement as less important (Figure 6). Tourists with disability perceived pedestrian crossings with ramps with tactile paving as less important [$\chi^2(1) = 64.586$, $p <0.001$], as well as tactile pavement in the boarding area [$\chi^2(1) = 52.501$, $p <0.001$], and tactile warning strips on the waiting platform [$\chi^2(1) = 62.385$, $p <0.001$].

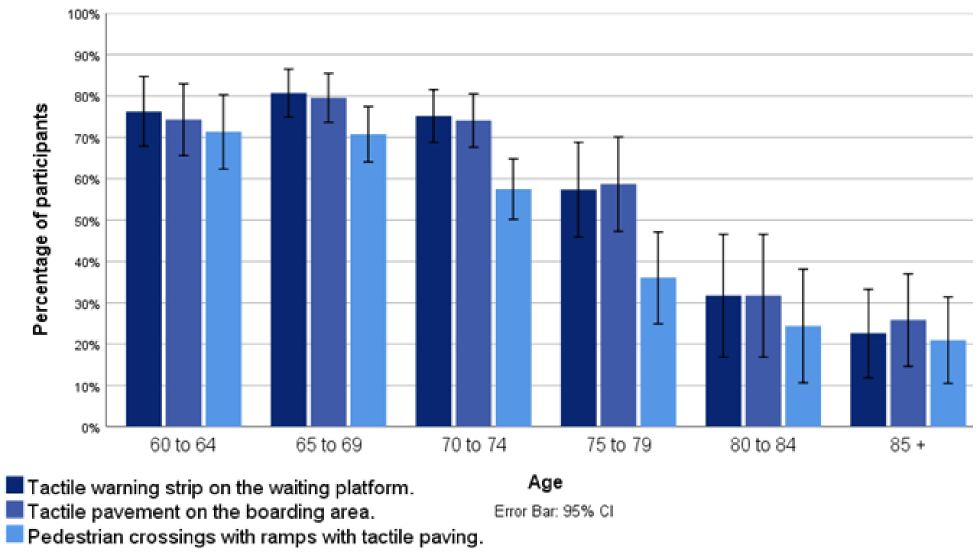

Figure 4. Percentage of tourist participants by age that consider tactile pavement important

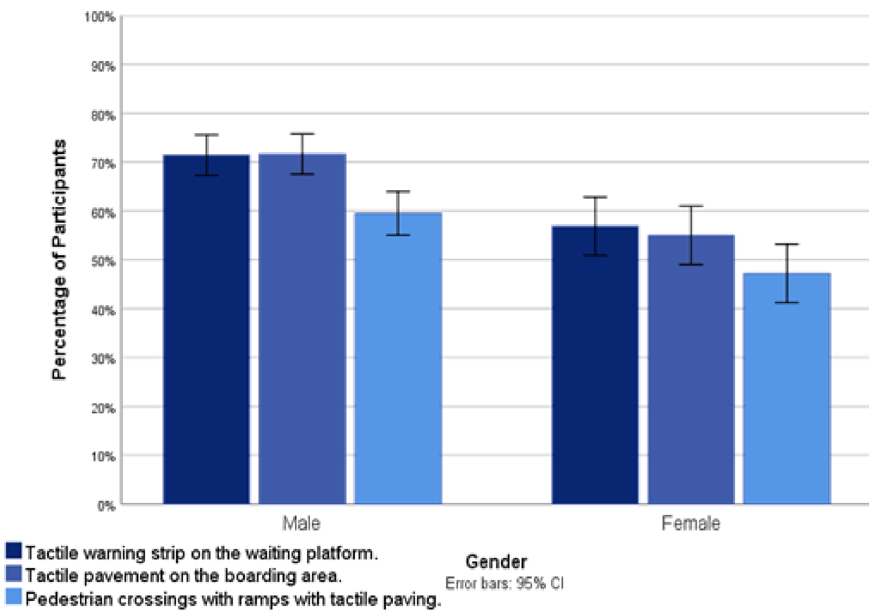

Figure 5. Percentage of tourist participants by gender that consider tactile pavement important

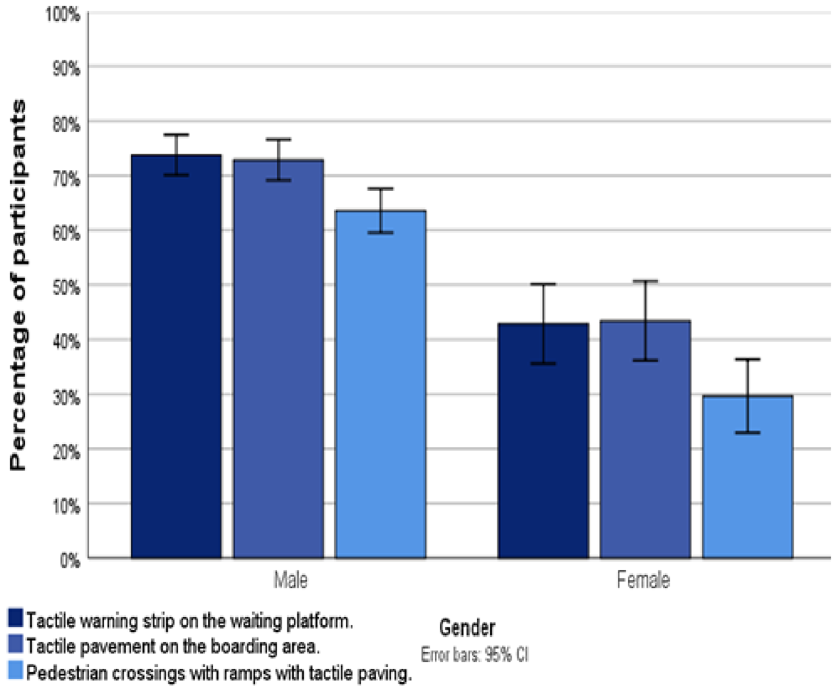

Figure 6. Percentage of tourist participants with disability that consider tactile pavement important

4. DISCUSSION

In the present research older people perceive pedestrian crossings with dropped kerbs with tactile paving as less important, as well as tactile pavement in boarding areas, and tactile warning strips parallel to the kerb on the waiting platform. With the same tendency, older people with disabilities perceive pedestrian crossings with ramps with tactile paving as less important, as well as tactile pavement in boarding areas, and tactile warning strips on the waiting platform.

This lack of interest in tactile pavements by elderly people can be interpreted in different ways. The ability to detect different kinds of textured surfaces underfoot varies from one person to another. People with arthritis or other mobility impairments can consider these surfaces uncomfortable, as can tourists with trolleys.

The use of the blister surface at uncontrolled crossings was introduced in the 1990s in the United Kingdom. The original blister surface which comprised rows of hard rounded blisters around 6 mm high was modified to make it less uncomfortable. The profile of the blister surface comprises rows of flat-topped 'blisters', 5 mm (±0.5 mm) high. At 4.5 mm (the lower tolerance) the surface will still be effective. If the blisters fall below that height the effectiveness of the surface will be significantly reduced and will ultimately become undetectable (below 3 mm the material is likely to be virtually undetectable).

Meanwhile, tactile blisters 25 mm in diameter and 5 mm high, considering the perceptions of adults aged over 60, were investigated in a laboratory [21]. The authors reported that rhythmic walking did become more variable, suggesting a degree of variation in stability, but no falls were reported.

According to Dubai Universal Design Code [22], tactile pavements should have a reflectance contrast with the surrounding pavement of at least 50 points LRV (Light Reflectance Value) and the height or depth of this pavement cannot be greater than 4 mm. Warning pavement should be constructed of truncated cones arranged in a square grid or diagonal rows and installed with bands oriented in the crosswise direction of the course of travel (Figure 7). Guiding patterns should be constructed of flat-topped elongated bars. Bars must be oriented in the direction of the course of travel (Figure 8). The characteristics of truncated cones and flat-topped elongated bars will mitigate the discomfort of people.

The concept of “minimum toe clearance” (MTC), or more generally “minimum foot clearance” (MFC) translates a measure of the risk of the foot swing contacting the walking surface or other object during the swing phase of walking [23]. This author reported the MFC = 1.12 cm in healthy elderly people. Group standard deviation in MFC has been reported as 0.68 for elderly adults by Karst et al. [24]. So, the dimension of 4 mm is correct considering this health research.

Taking into account the reported perceptions, and the increased number of people with visual disability, the use of tactile paving surfaces is essential; however it is also important to minimize any adverse impact or discomfort for sighted pedestrians or older people.

The use of colour contrast in tactile paving surfaces with the surrounding floor can assist partially sighted people and older adults, as they will be aware that the “obstacle” exists and avoid it, and thus the possibility of a fall is greatly reduced.

The dimensions of tactile paving surfaces can be better thought through. For instance, at controlled pedestrian crossings and bus stop infrastructures, among others, there is no need for huge rectangles of tactile paving, as occurs in a lot of countries. These installations are not helpful to blind people and are a nuisance for others that tend to prefer blister-free pavement to stand on and whilst waiting to cross [25]. According to this author, blind people only need information within the correct configuration; excessive installations aggravate public opinion against tactile paving and considers that when tactile paving is installed correctly, it can hardly be called a discomfort to sighted people.

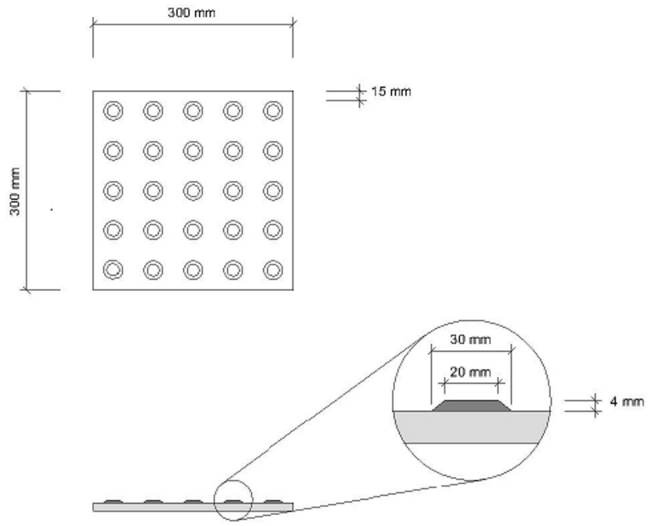

Figure 7. Age friendly warning pavement *(*Source: adapted from [22])

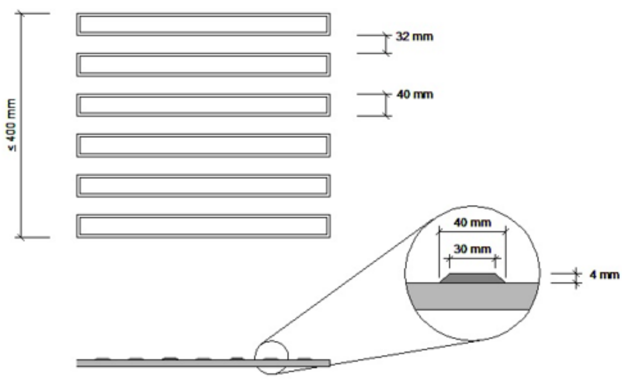

Figure 8. Age friendly guiding pavement (Source: adapted from [22])

Finally, it is very important that tactile surfaces are adequately installed. If there is an incorrect implementation it can increase the risk of tripping for visually impaired people.

Regular maintenance is also important in preventing and fixing trip hazards, such as uneven paving, and it is essential for all to repair as soon as possible whilst in the meantime, highlighting and cordoning off the hazard area.

5. CONCLUSIONS

This survey influenced a collaborative design process to develop relevant inclusive urban solutions at bus stops and in the surrounding environment. The results facilitate identifying urbanistic needs and priority areas for action to improve the built environment associated with bus stops [12].

Although the sample size is appreciable, this study has some limitations. The respondent tourists were sufficiently healthy to be in a mobile condition at Faro Airport. The most severely ill people (for example, those who were institutionalized) and those who have no financial access to tourism experiences, amongst others, were not considered in the study. So, the group of tourist respondents may not be representative of all older adults.

The results should not be extrapolated to the world population as the majority come from developed European countries.

Another limitation of the study is the larger proportion of men (to women) and the small number of respondents aged 85+ when these specific age groups have multiple disabilities.

The nature of the disabilities is mainly related to motor, hearing and visual, and few concern orientation problems. Intellectual disabilities are not well represented, so the perceptions of elderly tourists with these specifics are not equally considered.

A large percentage of respondents are urban residents, consequently the perceptions of rural residents are not equally reflected.

It is suggested that complementary studies should be carried out, to provide a wider and deeper understanding of the reasons for elderly people not using different means of public transport.

Sidewalk quality, pedestrian safety and esthetics, have been associated with the physical activity of people and help to guarantee an age-friendly built environment which is essential for local elderly people and for senior tourists in particular.

In a context of inclusive mobility, the needs of people with visual disabilities have been considered mainly in the developed world. Specific installations have been provided, for instance, tactile paving acts as guidance (e.g. complex transport terminals) creates detectable safety warnings of road edges (e.g. blister surface), acts as hazard alerts for the top/bottom of steps (e.g. corduroy surface). All over the developed world, different types of tactile paving surfaces are used. In a perspective of world accessible tourism there is a need for internationally synchronised installations. This work reinforces the need to integrate tactile paving surfaces within the European Union. It is essential to adopt a common and universal language that can be used internationally in all contexts of pedestrian infrastructures and public transportation. The scope of universal accessibility also involves standardizing language, signs and their meanings.

Within the scope of the ACCES4ALL Research Project, it is thought necessary to overcome territorial boundaries and devise possible alternatives to existing tactile pavements for the inclusion of elderly people that are 80+ years old. The use of tactile paving surfaces is essential; however it is also important to minimize any adverse impact or discomfort for sighted pedestrians or older people. Personal strategies are used to adapt to perceived neighbourhood fall risks: walk around grates and uneven sidewalks and avoid certain streets all together, particularly those with cobble stones, large puddles, multiple sources of traffic, or where pedestrian accidents have occurred.

The use of smaller blisters can minimize changes in levels and reduce the risk of falling. The use of colour contrast surfaces with the surrounding floor can assist partially sighted people and older adults, as they will be aware that the “obstacle” exists and avoid it, and thus the possibility of a fall is greatly reduced. Presently, some surfaces that give information about a specific facility are based on a neoprene rubber or similar elastomeric compound. These impact absorbing materials are beneficial for older people and they are considered as tactile pavement.

To achieve alternative pavements, architects, material engineers and designers will have to develop new research and innovative solutions for tactile pavements, following collaborative processes that include elderly people, participants with visual impairment and others. These alternatives must be more carefully designed to promote safer conditions for older pedestrians.

This is particularly important for age-friendly bus stops, important elements of pedestrian infrastructures and transportation systems [12].

Lastly, it is also important to highlight that since this paper gathered a diverse sample of elderly people from several countries, our findings can be applied to the European population. Future research will consider a similar survey at Faro Airport which incorporates the total number of visitors and not only senior citizens.

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NOMENCLATURE

LRV	Light Reflectance Value
MFC	Minimum Foot Clearance
MTC	Minimum Toe Clearance
NFC	Near Field Communication
QR	Quick Response
SPSS	Statistical Product and Service Solutions