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## A PARTICULAR LOOK AT PUBLIC PEDESTRIAN SPACES FROM THE PERSPECTIVE OF PEOPLE WITH DISABILITIES

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**Abstract:** Pedestrian public spaces are areas where people walk. They are characterized by sidewalks, walkways or other areas restricted to pedestrian traffic. However, these spaces are also used by pedestrians with special conditions or not. Such spaces have been neglected for people with physical disabilities (PWD) or reduced mobility (PMR). On the sidewalks of most Brazilian cities, people with mobility difficulties, those who are totally or partially deprived of the ability to move, many of whom require some type of equipment to facilitate their mobility, encounter adverse conditions for their full right to move. The objective of this study was to identify the perspective of people with disabilities (PWD) and reduced mobility (PMR) in relation to pedestrian spaces in terms of the most common materials used in the construction of sidewalks, the most common defects and the quality of accessibility ramps. at public road intersections, using satellite images. The methodology used in this study was the questionnaire as a data collection technique, of an exploratory and cross-sectional descriptive nature. The questionnaire addressed the most common types of materials used on sidewalks, the most common defects and the quality of accessibility ramps at public road intersections. A Likert scale from 1 to 5 was used to express the quality of these pedestrian spaces (1 = poor and 5 = excellent). The data collection period was from December 2022 to January 2023. The people who responded to the questionnaire totaled 50 responses. The results indicated that the quality and state of conservation of pedestrian spaces, perceived by wheelchair users, varied according to the type of material used. Floors with greater roughness and texture were preferred and classified as good or better. The most common sidewalk defects experienced by wheelchair users ranged from poor to fair, when there were bumps, depressions, stains with more

than one type of coating, widespread damage and the presence of different species of grass in the sidewalk area. These situations impose additional suffering and stress on people with mobility difficulties to overcome the condition of pedestrian spaces. The quality of the ramps suggests that they need better standardization, as well as a greater number of access ramps to pedestrian spaces. Concern for the conservation of pedestrian spaces by local authorities can greatly contribute to satisfactory accessibility and mobility in urban pedestrian spaces for people with or without physical limitations.

**Keywords:** Sidewalk barriers, defects in sidewalks, pedestrian material, street furniture, accessibility ramps, coating of sidewalks.

## INTRODUCTION

The challenges faced by elderly pedestrians are numerous and can be found in various public areas (AGUIAR, 2010), such as sidewalks with irregular curbs and ramps, poorly positioned street furniture, inadequate vegetation and often damaged and unsuitable flooring. These obstacles make it difficult for pedestrians in general, but especially for the elderly, people with disabilities (PWD) and people with reduced mobility (PMR). Furthermore, at intersections, the difficulty of crossing streets is exacerbated by the lack of traffic lights with exclusive time for pedestrians, combined with intense vehicle traffic (LUNARO; FERREIRA, 2005)

Studies that seek to identify and evaluate the variables of physical and environmental characterization of sidewalks and public sidewalks were well addressed by Lunaro and Ferreira (2005), since spaces intended for the circulation of elderly pedestrians are considered important in terms of comfort, safety and environmental conditions (AGUIAR, 2010). This study was developed in

the city of Barretos, SP and the research results indicated the most important attributes of physical and environmental characterization of sidewalks were:

One of the quality aspects studied revealed that the environment preferred by elderly people for walking must present, firstly, comfortable conditions for movement without the existence of obstacles or any other elements that make walking difficult and also offer safety, especially during walking, crossing the streets. Next, the aesthetic aspect of the environment was considered the most important in characterizing the quality of the environmental aspects of sidewalks and urban public spaces, according to the interviewees' preferences, followed by the existence of adequate trees along the sidewalk, the possibility of in-depth vision the environment and, finally, the existence of furniture that guarantees protection against bad weather on sidewalks (LUNARO; FERREIRA, 2005)

PWDs face physical, sensory or mental limitations, often encountering difficulties and incapacities in carrying out daily activities, which results in significant challenges when moving around the urban environment (VASCONCELOS and PAGLIUCA, 2006; AGUIAR, 2010). These authors examined the conditions of urban architecture and internal accessibility of around 12 basic health units in a city in Ceará, with approximately 143,000 inhabitants. The study highlighted that, among the locations evaluated, sidewalks frequently had holes and unevenness. Irregularities in the pavement of streets and avenues close to health establishments, in most cases, significantly hampered the mobility of PWD and PMR.

Urban accessibility in the daily lives of families with children with neurological disabilities was studied by Castro, Camargos and Farias (2020), and these authors demonstrate that family members face different setbacks to overcome the existence

of urban barriers, which make it difficult for people with physical disabilities to move around. Another point observed in the research is the rarefied number of ramps. These authors further report:

Urban barriers are those that make it difficult for people with disabilities or those with reduced mobility to access or move around spaces. These barriers exist in public and private places and prevent the exercise of citizenship to its fullest, due to the difficulty of getting around. Examples of urban barriers are: stairs, sidewalks with steps, ramps with exaggerated slopes, narrow doors, among others. Inadequacies in accessibility not only violate the laws, they also make it difficult for disabled people and individuals with reduced mobility to move around, harming inclusion and increasing demand and concern among family members. Given this, it is important that public authorities participate more actively in issues relating to accessibility, ensuring that the law is actually complied with (CASTRO, CAMARGOS and FARIAS, 2020).

Sánchez and Justicia (2005) examined the quality of the physical environment at the University of Granada in Spain, interviewing 23 students with physical disabilities. More than half of the students evaluated considered the services and access to the various units on campus to be adequate. However, 47.8% reported a lack of reserved spaces for disabled people in the parking lot. It is important to highlight that more than 30% of participants considered public transport inadequate for their needs, and more than 47% indicated that reserved parking spaces are not respected.

The Municipality of Petrópolis, RJ, Brazil, launched the “Sidewalk Implementation Manual” with the aim of promoting safe, comfortable and quality sidewalks in the municipality. One of the main emphases in accessibility for people with disabilities (PWD) or reduced mobility is the creation of accessible routes. These routes are

characterized by special floors that provide autonomy, safety and comfort, especially guiding people with visual impairments or low vision in traffic on public roads and urban areas. The manual highlights the importance of ensuring unobstructed paths and clear identification of obstacles along the entire length of sidewalks, access roads, sidewalk drops and dividing beds (SIDEWALK IMPLEMENTATION MANUAL).

The University of Cape Coast, Ghana, West Africa, has undertaken a series of interventions to enable humanitarian access to its facilities for all students, regardless of disability. These observations were reported by Odame and Amoako-Sakyi (2019), in which attention was focused on modifications to internal spaces and the inclusion of accessories for disabled people in the construction of new facilities, as well as in the development of university policies aimed at disability, regarding admission, residential status, and other aspects of campus life. The study found that the absence of sidewalks in some areas with high pedestrian traffic, the discontinuity of sidewalks and objects that obstruct the path were the main factors that reduced the mobility with which students with physical disabilities could use sidewalks on campus.

Studies on the perception of people with physical disabilities, people with visual impairments and even the elderly are extremely important for the management of urban public spaces. In this aspect, Klein and Grigoletti (2021) evaluated the spatial accessibility in Parque João Goulart (PJG), located in the city of Santa Rosa, in the interior of the state of Rio Grande do Sul, in order to collaborate with the planning of more suitable leisure spaces to your needs. These researchers further noted that:

For the majority of interviewees, it is important that the public space provides activities and attractive spaces that invite

people, whether inside or not, to constantly frequent the place. They also noted that the more physical limitations people have, the more sensitive they are to issues of pedestrian accessibility. The perception of PWD and reduced mobility is essential to understand and point out the flaws in the built environment in terms of not meeting specific needs. People with physical disabilities are more easily able to identify barriers that are imposed on people with visual impairments, for example, indicating a more comprehensive assessment of accessibility. People with visual impairments, on the other hand, associate accessibility with their specific needs, such as the tactile floor, and information in Braille and sound (KLEIN and GRIGOLETTI, 2021)

Interest in including people with disabilities in street racing has grown significantly. Public policymakers and urban planners are increasingly aware that public spaces often have inadequate design, creating multiple physical barriers that impede the independent participation of people with disabilities in street running events (AL-TAESH and UJMA-WASOWICZ, 2021). The research carried out by these authors was a significant contribution to the field of accessibility. They examined around 110 runners from different parts of the world who participated in specific events for people with disabilities. Among these runners, 56% were wheelchair users and 43% were visually impaired. The study included the application of a questionnaire focused on several main questions:

The first question was about the type of flooring that is important for a hallway. This was measured with three items included (yes, no, and not sure). The second question asked respondents to select which surface must be avoided and was measured with five items included (irregular, various heights, cobblestones, concrete, and asphalt surfaces). The third question asked respondents to identify one of seven permanent street elements that positively influence the organization of the

running environment (lighting, ramps, trees and green areas, flat surfaces, special lines, interesting architecture, and street connectivity). Furthermore, the negative impact on the organization of the race environment was measured through six items (curbs, signage, lighting, several main streets, street conversion and elements (trash bins, benches, telephone booths, fire hydrants, bollards, manholes and so on). The fourth question asked respondents to evaluate the perception of physical elements of the street that become barriers for physically and visually impaired runners in street running (curbs, cars, cyclists, street signs, trees and green areas, benches, lighting, and trash containers) on a 5-point Likert scale, with 1 being totally disagree to 5 being totally agreeing (AL-TAESH; UJMA-WASOWICZ, 2021).

Al-Taesh and Ujma-Wasowicz (2021) also highlight that 89.09% of runners with infrastructure deficiencies agreed that the type of street surface is important for runners. Irregular and bumpy surfaces were identified by 32.72% of runners, and various bumpy surfaces were observed by 29.99% of runners.

The lighting of public roads and flat floors (20.0% and 10.0%, respectively) had positive importance, but curbs (pavement reserved for vehicles), traffic signs and various floors with projections (17.27%, 7.27% and 8.18%, respectively) had a negative impact on organizing races for visually impaired runners. Respondents were asked to evaluate the elements of permanent urban street furniture that positively influence the organization of a race for runners with disabilities, including lighting, ramps, trees and green areas, flat surfaces, special lines, interesting architecture and sidewalk connectivity. Athletes with physical disabilities gave greater importance to lighting, flat surfaces and sidewalk connectivity, with values of 17.27%, 15.45% and 7.27%, respectively. Athletes with visual impairment scored much higher in terms of importance for lighting (20.0%) and flat

surface (10.0%).

Sánchez-Suárez et al. (2022) carried out an assessment of the pedestrian infrastructure in the urban center of Matanzas, Cuba, using pedestrian perception as a basis. The authors found that the characteristics of the pedestrian infrastructure most valued by users of the historic center included the quality of the pavements and the availability of rest areas. Information about pavements, streets and sidewalks was collected through complaints and suggestions forms, accessible by telephone for user support. The survey revealed that aspects such as the growth of pedestrian infrastructure, perceived as inadequate by 76% of respondents, and rest areas, considered insufficient by 52% of participants, did not adequately meet the real needs of pedestrians.

The use of geotechnology techniques to visually evaluate pedestrian spaces, using satellite images, was recently addressed by Bonani et al. (2024). These authors evaluated the central region of the city of Monte Alto-SP-Brazil, regarding the quality and presence of accessibility ramps, the most common defects in sidewalks and the types of materials most used in pedestrian spaces. The study showed that the quality of accessibility ramps was rated between good and very good in the central region of the proposed accessibility corridor, but as it moves away from the shopping center, the number of accessibility ramps becomes rarer. The types of covering materials used on the sidewalks of the proposed corridor are predominantly of the “Portuguese mosaic” type, and in regions further away from the central street, the predominance of “slatted or smoothed mortar” covering, with and without painting. The most common sidewalk defects in the accessibility corridor had an assessment considered regular. It is worth remembering that in public road pavements close to the city center region, and in old neighborhoods,

further away from the center, and around the city’s bus terminal, the material “hexagonal tile” predominates.

Based on the above, the objective of this study was to identify the point of view of people with disabilities (PWD) and reduced mobility (PMR) in relation to pedestrian spaces regarding the most common type of materials in the construction of sidewalks, the most common defects and the quality of accessibility ramps at public road intersections, using satellite images.

## MATERIAL AND METHODS

The methodology used in this study was the use of a questionnaire as a data collection technique, of an exploratory, transversal, descriptive nature, through observation by members of the public who use wheelchairs, or who use crutches or walkers. The questionnaire was organized on Google Docs, in which a link shared with the target audience was generated. The questionnaire considered three situations normally experienced by those who are considered people with physical disabilities (PWD) or people with reduced mobility (PMR). Situation 1 concerns the most common types of materials (coating) used in the construction of sidewalks most experienced by PWD (Appendix 1), according to Rodrigues and Chiconato (2023). Situation 2 concerns the most common sidewalk defects experienced by PWD (Appendix 2) and situation 3 concerns the perception of PWD or PMR in relation to the quality of ramps for wheelchair users at public road intersections (Appendix 3). The Likert scale (1932) was used, from 1 to 5 to express the quality of these coverings or conservation of public spaces, considering 1 as poor, 2 as regular, 3 as good, 4 as very good and 5 as excellent. The questionnaire was organized with abundant visual material collected using smartphones, from public spaces in

the cities of Taquaritinga-SP and Jaboticabal-SP, images made in size 15 x 22 cm, to guarantee the richness of details of the three situations mentioned. previously according to Rodrigues' technique (2023). The data collection period was from December 2022 to January 2023. The people who responded to the survey comprised 50 people, all of legal age, 23 women and 27 men, contacted directly (4), contact via social networks, such as Facebook and Whatsapp (38) from different regions of Brazil, and 8 by recommendations from the public social secretariat area representing the cities of Jaboticabal-SP, Ibitinga-SP and Taquaritinga-SP.

The coverings to be observed, in situation 1 (Appendix 1) were the most common types of materials in sidewalk coverings. In situation 2, this was the most common type of defect in sidewalk coverings in terms of accessibility.

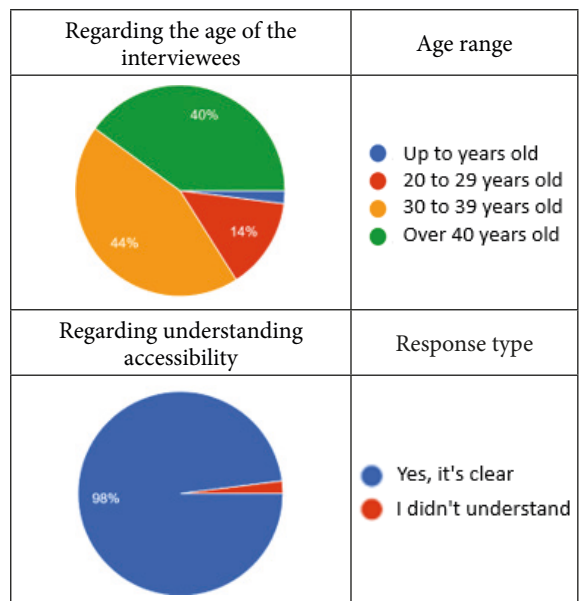
In situation 3, images were displayed of six ramps providing accessibility to the sidewalks, two of which appeared to be in a good state of construction and conservation, and another four ramps with different apparent degrees of non-conformity and state of conservation.

## RESULTS AND DISCUSSION

The data collected through this study reveal the point of view of PWD and PMR in relation to urban mobility and its implications. In this sense, Grubba and Pissolatto (2023) highlight some principles for the full inclusion of PWD through urban mobility, such as the economic, social and environmental dimensions (with emphasis on the sustainable development of cities), equity and effectiveness in access to services and democratic management by public authorities, and in order to have a good movement on public roads it is necessary to emphasize the efficiency of factors such as the space in which the route will take place, as well as the time it will take to travel it and its state of conservation.

Although the population has become increasingly aware over the years, there is still a lot to improve in relation to the inclusion of PWD. Regarding social sensitivity to the limitations of PWD and PMR, Da Silva and Ribeiro (2021) carried out research with PWD and PMR, comparing it with the view of people without disabilities. The results demonstrated that 43% of PWD indicate that society has partially become aware of the causes of inclusion, while 49.1% of people without disabilities believe in this (DA SILVA and RIBEIRO, 2021).

The particular characteristics of the group evaluated in this work are shown in Figure 1. A balance is demonstrated between the age groups from 30 to 39 years old, and the age group over 40 years old. The majority of interviewees understood the proposal to evaluate accessibility aspects (Figure 1).

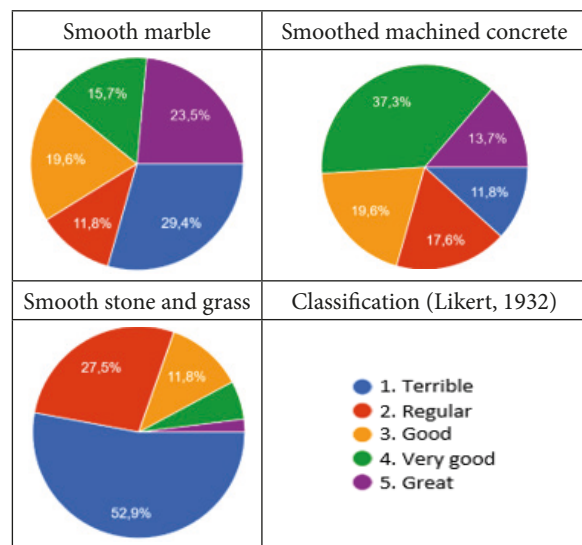


**Figure 1.** Information regarding the age of the interviewees and the understanding of the type of sidewalk covering to provide ease of accessibility

**Source:** The authors, 2024

The main highlights of the perception of wheelchair users in relation to the main types of coverings (Appendix 1) are shown in Figure 2, smooth marble, smoothed

machined concrete, smooth stone and grass. Smooth marble had a rating between poor and fair, close to 40.2%, a good indication of low acceptability. Smoothed machined concrete, although quite rustic, presents considerable material roughness, which probably facilitates the traction of equipment that has rubber-coated wheels, as is common in wheelchairs. On the other hand, the coating material smooth stone combined with grass was very strongly rejected by the interviewees (approximately 70%), a serious indication that such coating must be avoided when planning sidewalks, probably due to the fact that grass occupies a small space between the smooth stone or other type of stone, allowing wheelchairs or even baby strollers to have their wheels secured in the space occupied by the grass. Sidewalks of this type demonstrate a unique beautification as an urban landscape and even allow water infiltration during the rainy season, however, it makes it difficult not only for wheelchair users, but also for people who use crutches or walkers. It is not uncommon for non-permeable people to trip over sidewalks with this type of coating.



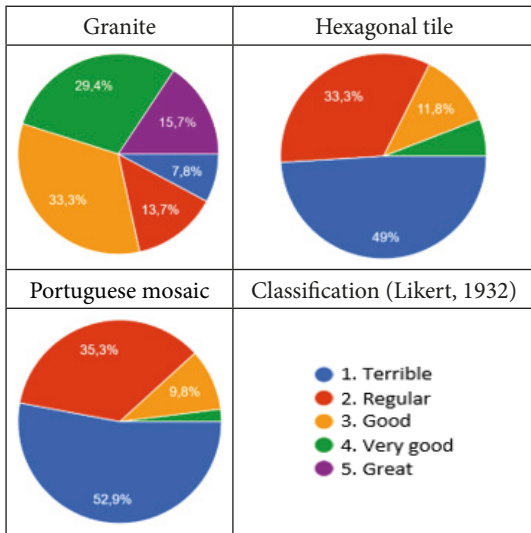
**Figure 2.** Information on the perception of three types of coverings: smooth marble, machined concrete and smooth stone and grass

**Source:** The authors, 2024

Figure 3 shows the types of sidewalk coverings that are most rejected by people who use wheelchairs and who responded to the questionnaire. The hexagonal tile and Portuguese mosaic covering showed more than 80% rejection. The first, because when it is assembled to serve as a floor, it allows there to be a distance between one tile and another, causing small bumps and vibrations. The second covering, Portuguese mosaic, is very common in the central region of many cities in the interior of the State of São Paulo, according to reports by Costa and Rodrigues (2023), Chiconato et al. (2023), Lopes, Rodrigues and Castro Filho (2023). Although the Portuguese mosaic sidewalk coating contributes to the beautification of urban architecture, not only on sidewalks, but in wider areas, due to the fact that it explores the formation of different designs, as it comes in beige, black, pink and white. However, in terms of accessibility and pedestrian mobility, it has its restrictions, as over time it requires maintenance, as it is common for the formation of ripples, or even the detachment of pieces (stones), which can cause accidents with people included or not.

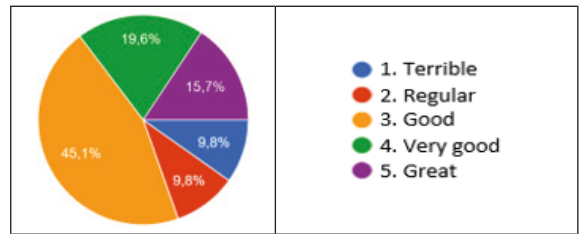
Chiconato et al. (2023) very well reinforce the presence of Portuguese mosaic cladding in the central region of the city of Taquaritinga-SP-Brazil (Figure 3), probably inherited from the skill of builders of Portuguese and Spanish colonization origins, in the interior cities of the state of São Paulo. Silva, Rodrigues and Proença (2023) found the same behavior of Portuguese mosaic-type coverings, in the city of Monte Alto, SP, Brazil. These authors managed to detect in that city the use of hexagonal tiles on the pavement of public roads, both in remote neighborhoods and in regions close to the city center (BONANI et al., 2024).





**Figure 3.** Information on the perception of three types of coverings: granite, hexagonal tile and smooth stone and portuguese mosaic

**Source:** The authors, 2024

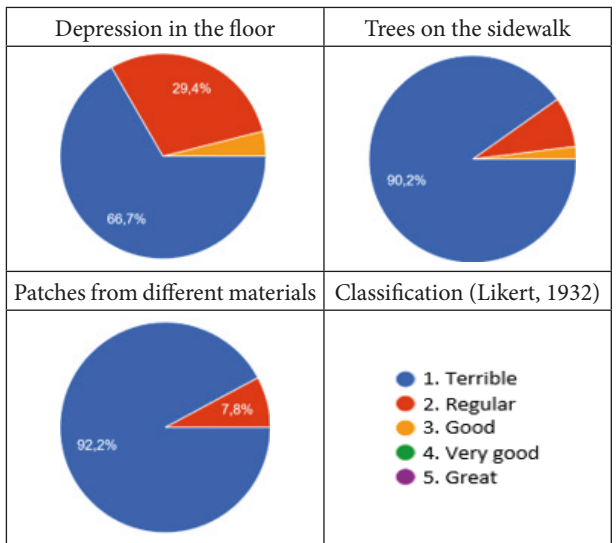


**Figure 4.** Information on the perception of three types of coverings: Smoothed mortar, Smoothed machined concrete, and stone and marble

**Source:** The authors, 2024

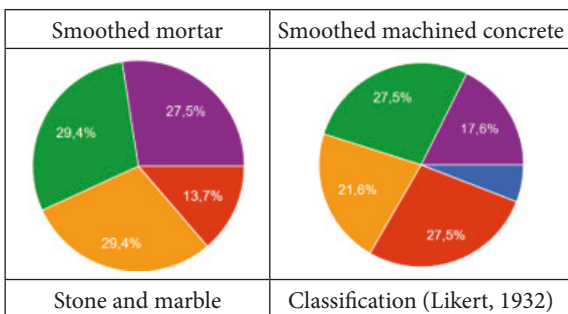
When comparing smoothed or lathed mortar, machined smoothed concrete and stone and marble (Figure 4) it is noted that these three coatings were well evaluated by the target audience of this research. This is probably due to the roughness of these materials, which provide better traction for mechanical or electric wheelchairs. These perceptions converge with the results of Costa and Rodrigues (2023), Lopes, Rodrigues and Castro Filho (2023), mainly with the main characteristic in neighborhoods further away from the central region of the city of Taquaritinga-SP-Brazil.

In Figure 5, very common defects can be seen in the sidewalks of the cities of Jaboticabal-SP, Taquaritinga-SP, Monte Alto-SP and Dobrada-SP, in terms of the presence of light depressions, trees planted on narrow sidewalks and patches of different materials on the sidewalks. (GODOY et al., 2023; BONANI et al., 2024), being much more common in neighborhoods further away from the city center.



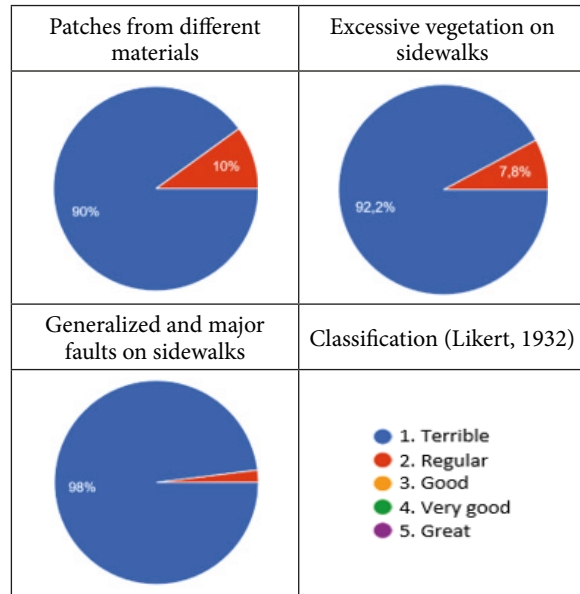
**Figure 5.** Information on the perception of three types of defects more common in sidewalks: Depression in the floor, Trees on the sidewalk, and Damages to sidewalks.

**Source:** The authors, 2024



The figure 6 shows the most serious defects from the point of view of the PCD that were part of this research, among which are patches

made of different materials, excessive presence of grasses and widespread damage with PV exposure (visitation point). on the sidewalks. These data indicate the most serious defects in sidewalks that hinder the full movement and mobility of PWD or PMR in pedestrian spaces.



**Figure 6.** Information on the perception of three types of defects more common in sidewalks: Patches on sidewalks, Excessive vegetation on sidewalks, and Generalized and major faults on sidewalks.

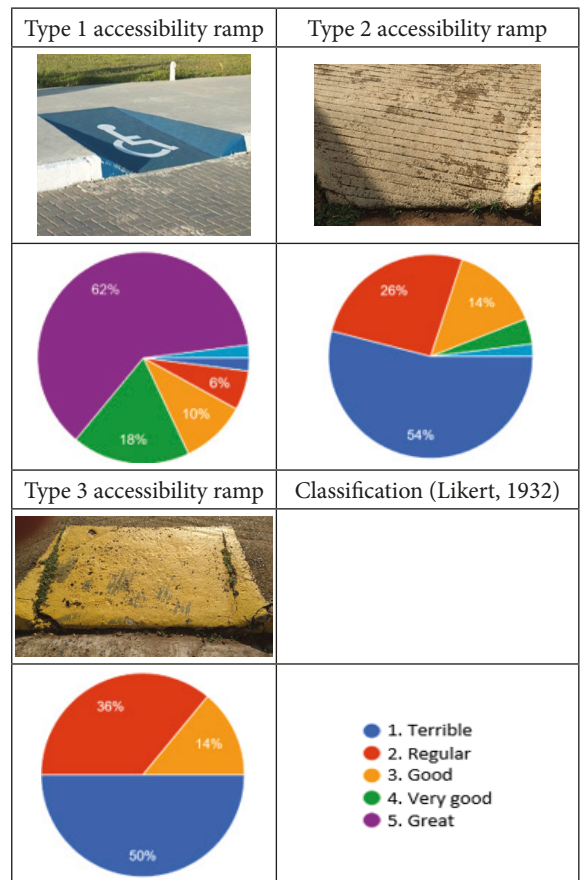
Source: The authors, 2024

Another important requirement for the full displacement of PCD or PMR can be seen in Figure 7, which shows three types of accessibility ramps, with different states of conservation and construction characteristics. They can appear at the intersection of public roads (crossroads) or even on any part of the sidewalk, in the middle of the block, generally present in commercial establishments or establishments of public interest, on both sides of the road.

None of the ramps met ABNT standards (2020) and the public surveyed was aware of this fact. However, the perception of those interviewed regarding the quality and state of conservation, form of construction and

ease of access is clear. In this aspect, the type 1 ramp had an exceptional evaluation, while the type 2 and 3 accessibility ramps were not well evaluated because they are narrow and the base for accessing the ramp has a significant protrusion, making it difficult for the wheelchair's front wheels to move. wheels for smooth sliding, and requiring considerable effort from the wheelchair user, and in some cases, it can result in an accident, depending on the effort made to overcome the obstacle.

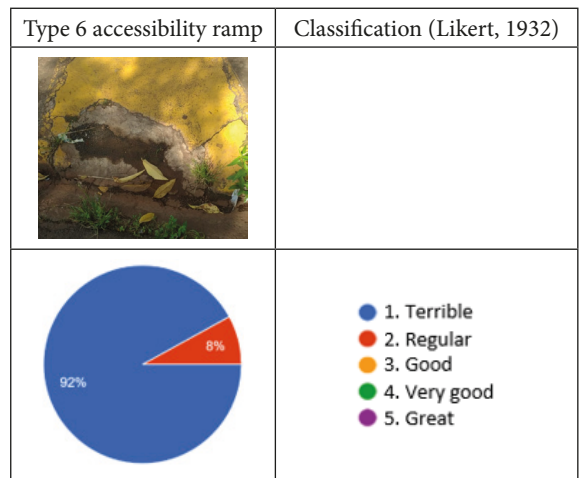
Situations such as those shown in Figure 7 reinforce the need for public authorities to adapt accessibility ramps in terms of ramp width, roughness of the material, presence of signaling floors for the visually impaired and slope associated with adequate signage, as shown in the ramp type 1 accessibility.



**Figure 7.** Information on the quality of three types of ramps in terms of accessibility and state of conservation: Type 1, Type 2 and Type 3.

Source: The authors, 2024

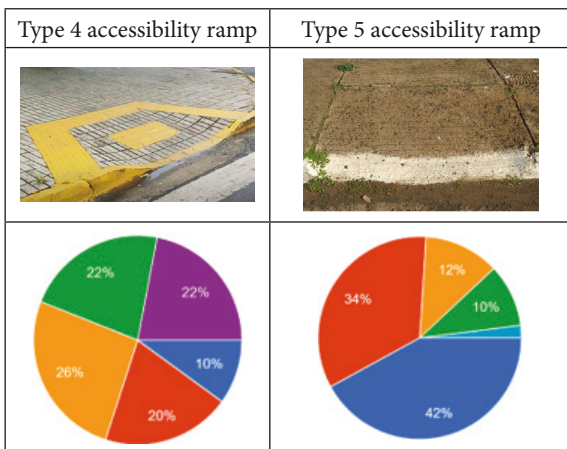
The figure 8 shows information on the quality of three types of ramps in terms of accessibility and state of conservation: Type 4, Type 5 and Type 6. The Type 4 accessibility ramp showed a slightly more widespread acceptance compared to the Type 1 ramp, but good to excellent acceptance by 70% of the interviewed public. Although the ramp has a good slope, visual information with clear painting, and a tactile signaling floor, the importance of the perception of a very heterogeneous group, who were part of this study, is clear. The Type 5 ramp, which had perfect insertion next to the public road guide, had a good inclination and the roughness of the material used had a restricted acceptance (22%). In relation to the Type 6 ramp, what was expected occurred. It had a poor classification and ramps of this type exist in few cases in cities where pedestrian accessibility using satellite images has been evaluated (GODOY et al. 2013; CHICONATO et al. 2023; COSTA and RODRIGUES, 2023; LOPES, RODRIGUES and CASTRO FILHO, 2023; BONANI et al., 2024).



**Figure 8.** Information on the quality of three types of ramps in terms of accessibility and state of conservation: Type 4, Type 5 and Type 6.

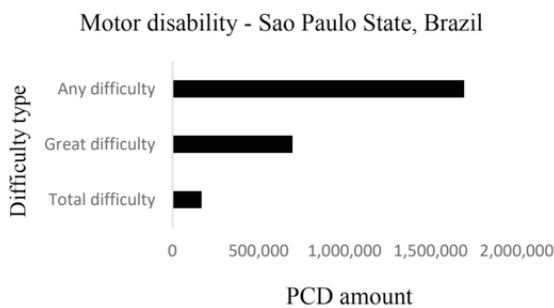
**Source:** The authors, 2024

The reports by Al-Taesh and Ujma-Wasowicz (2021) corroborate this study by highlighting the importance of the quality of sidewalk and curb coverings (pavements). This aspect is in line with the observations of Sánchez-Suárez et al. (2022), who emphasized the need to prioritize the characteristics of pedestrian infrastructure most valued by users of the historic center, especially the structures of pavements, streets and sidewalks. Recent reports by Bonani et al. (2024) reinforce the need for public authorities to genuinely concern themselves with adapting the planning of pedestrian spaces, regarding the adequacy of urban furniture, quality of coverings and minimization of defects on sidewalks, in order to allow better accessibility and pedestrian mobility, mainly for people with physical disabilities or reduced mobility, and that law number: 13,146 (2015) in Brazil is actually complied with. The aforementioned law deals with the inclusion of PWD, based on the principles of equality and exercise of citizenship, and to this end, the importance of accessibility is highlighted, considered as one of the basic factors the elimination of physical barriers in public environments,



which restricts the movement and full social inclusion of these people (BRASIL, 2015).

In the State of São Paulo alone, in the latest survey published by the Brazilian Institute of Geography and Statistics; IBGE, in 2010, more than 2 million people had motor disabilities, whether with loss of total mobility, severe difficulty in locomotion or some difficulty, according to Figure 9 (IBGE, 2010).



**Figure 9:** Population with motor difficulties in the State of São Paulo, Brazil

**Source:** Adapted from IBGE (2010)

At the time mentioned, the number amounted to around 7% of the State's population, which demonstrates a significant amount. Pimentel and Pimentel (2017) question the small number of PWD or PMR in public environments, such as culture and leisure, with the number of these people in Brazil identified by bodies specializing in statistics is increasingly growing. These authors

indicate that, despite significant advances in recent years, the effective implementation of accessibility on public roads is still a preponderant factor for the real inclusion of PWD and PMD, which is essential for a fairer society.

## CONCLUSION

The technique of using a questionnaire using satellite images proved to be suitable for evaluating the perception of people who use wheelchairs or other equipment to aid mobility in pedestrian spaces. The state of quality and conservation of pedestrian spaces, in the perception of wheelchair users, must be considered for future planning of accessibility corridors by the local public authorities of any city.

Rustic and rough materials in the planning of sidewalks, such as lathed or smoothed mortar, with or without painting, provide good traction for mechanical or electric wheelchairs, in dry or humid environments. The most common defects in the vision of wheelchair users are related to the state of conservation of pedestrian spaces, and, secondly, the types of materials used. This study is useful as an instrument for public or private managers to use this information for perfect adaptation and planning of pedestrian spaces in an urban environment.

## REFERENCES

AGUIAR, F. DE O. **Acessibilidade relativa dos espaços urbanos para pedestres**. 190 p.2010. (Tese Doutorado). Escola de Engenharia de São Carlos, Universidade de São Paulo: São Carlos, 2010. Disponível em: <https://www.teses.usp.br/teses/disponiveis/18/18144/tde-21042010-193924/publico/tese.pdf>. Acesso em: 17/07/24.

AL-TAESH, N. & UJMA-WASOWICZ, K. Introducing the physical barriers in the city in-between buildings for disabled runners. **Current Urban Studies**, 2021, 9, 554-573. Disponível em: <https://www.scirp.org/journal/cus>. ISSN Online: 2328-4919. <https://doi.org/10.4236/cus.2021.93033>

ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS-ABNT. **Acessibilidade a edificações, mobiliário, espaços e equipamentos**. NBR 9050: BRASIL. 4ª. Edição, 147p., 03/08/2020. Disponível em: <https://www.ufsm.br/app/uploads/sites/391/2020/08/ABNT-NBR-9050-.pdf>. Acesso em: 14/07/2024. ISBN 978-65-5659-371-5

BONANI, Leandro *et al.* **Acessibilidade pendonal do corredor central da cidade de Monte Alto-SP**. In: Org. Basquerote, Adilson Tadeu Geografia e sociedade: compreendendo as dinâmicas globais 5, Ponta Grossa: Editora Atena, 2024. Cap. 2, p. 17 a 35. Disponível em: <https://atenaeditora.com.br/catalogo/ebook/geografia-e-sociedade-compreendendo-as-dinamicas-globais-5>. ISBN:978-65-258-2621-9. DOI:<https://doi.org/10.22533/at.ed.219241007>

BRASIL, 2015, Lei n. 13.146, de. Lei Brasileira de Inclusão da Pessoa com Deficiência. Disponível em: [http://www.planalto.gov.br/ccivil\\_03/\\_Ato2015-2018/2015/Lei/L13146.htm](http://www.planalto.gov.br/ccivil_03/_Ato2015-2018/2015/Lei/L13146.htm). Acesso em: 16 jul 2024.

DA SILVA, D. M.; RIBEIRO, A. C. D. Pessoas com deficiência e portadores de necessidades especiais: a visão geral das pessoas que não tem deficiência ou necessidades especiais em comparação com a realidade vivida pelas PCD/PNE. **Humanidades & Inovação**, v. 8, n. 59, p. 270-294, 2021. Disponível em: <https://revista.unitins.br/index.php/humanidadesinovacao/article/view/2046>. Acesso em: 18/07/24

CASTRO, G. G. de; CAMARGOS, A. S.; FARIAS, M. S. Barreiras de acessibilidade urbana: cotidiano das famílias de crianças com deficiências neurológicas. **Revista Família, Ciclos de Vida e Saúde no Contexto Social**, vol. 2, pp. 694-701, 2020. <https://www.redalyc.org/journal/4979/497965721004/html/>

CHICONATO, D. A. *et al.* **Pedestrian accessibility of the central aisle of the city of Taquaritinga, SP, BRAZIL**. **Scientific Journal of Applied Social and Clinical Science**, v. 3, n. 26, 2023. Disponível em: <https://atenaeditora.com.br/catalogo/artigo-revista/pedestrian-accessibility-of-the-shopping-center-of-the-city-of-taquaritinga-sp-brazil>. Acesso em 12/07/24. ISSN 2764-2216. DOI 10.22533/at.ed.2163262303103

COSTA, A. B. S. M.; RODRIGUES, G. A. **Avaliação da acessibilidade do trecho superior do corredor do quadrante 1 da cidade de Taquaritinga-SP**. **Interface Tecnológica – v. 20 n. 2, 738-750, 2023**. Disponível em: <https://revista.fatectq.edu.br/interfacetecnologica/article/view/1737/994>. Acesso em: 12/07/24. ISSN (On-Line) 2447-0864. DOI: 10.31510/infra.v20i2.1737

GODOY, G. F. V. *et al.* **Acessibilidade pedonal na cidade de Dobrada-SP, BRASIL** In: **Inclusão e contexto social: agenda contemporânea**. Org. Soraya Araújo Uchoa Cavalcanti, Ponta Grossa, PR: Atena, 2023. Pag.62 – 82. Disponível em: <https://atenaeditora.com.br/catalogo/ebook/inclusao-e-contexto-social-agendacontemporanea>. Acesso em: 12 de jul. de 2024. DOI: <https://doi.org/10.22533/at.ed.241230808>.

GRUBBA, L. S.; PISSOLATTO, L. **Mobilidade urbana para a inclusão da pessoa com deficiência (PCD)**. **Revista de Direito da Cidade**, v. 15, n. 4, p. 1937-1960, 2023. Disponível em: <https://www.e-publicacoes.uerj.br/rdc/article/view/66120>. Acesso em: 17/07/24.

IBGE, 2010. **População residente por tipo de deficiência, segundo a situação do domicílio, o sexo e os grupos de idade - Amostra- Características Gerais da População**. Disponível em: <https://sidra.ibge.gov.br/tabela/3425>. Acesso em: 17 jul 2024.

KLEIN, P.; GRIGOLETTI, G. de C. **A percepção de pessoas com deficiência e idosos sobre a acessibilidade: estudo no Parque João Goulart, RS**. **PARC Pesq. em Arquit. e Constr.**, Campinas, SP, v. 12, p. e021024, 2021. Disponível em:

<http://periodicos.sbu.unicamp.br/ojs/index.php/parc>. Acesso em: 11/07/24. ISSN 1980-6809. DOI: <https://doi.org/10.20396/parc.v12i00.8661766>

LEI Nº 13.146, DE 6 DE JULHO DE 2015. Institui a Lei Brasileira de Inclusão da Pessoa com Deficiência (Estatuto da Pessoa com Deficiência), 40p.2015. Disponível em: <https://www2.camara.leg.br/legin/fed/lei/2015/lei-13146-6-julho-2015-781174-norma-13146-pl.pdf>. Acesso em 14/07/2024.

LIKERT, R. A technique for the measurement of attitudes. **Archives of Psychology**, 22(140), 1-55, 1932. Disponível em: [https://legacy.voteview.com/pdf/Likert\\_1932.pdf](https://legacy.voteview.com/pdf/Likert_1932.pdf). Acesso em: 17/07/24

LOPES, D.C.; RODRIGUES, G. A.; CASTRO FILHO, C. P. de Acessibilidade pedonal no trecho inferior do primeiro quadrante da cidade de Taquaritinga-SP. **Interface Tecnológica** – v. 20 n. 2, p. 787-7999, (2023) Disponível em: <https://revista.fatectq.edu.br/interfacetecnologica/article/view/1754>. ISSN (On-Line) 2447-0864. DOI: 10.31510/inf.v20i2.1754

LUNARO, A.; FERREIRA, M A. G. Os espaços públicos e a questão da acessibilidade sob o ponto de vista dos idosos. **Ciência & Engenharia (Science & Engineering Journal)** 15 (2): 67 - 72, 2005. Disponível em: <https://seer.ufu.br/index.php/cieng/article/view/547/2691>. Acesso em: 11/07/24. ISSN 0103-944X

MANUAL DE IMPLANTAÇÃO DE CALÇADAS. Uma nova Petrópolis para todos. Prefeitura Municipal de Petrópolis. Disponível em: <https://xadmin.s3.us-east-2.amazonaws.com/6/PhotoAssets/282261/images/original/Prefeitura%20Municipal%20-%20Manual%20de%20Implantação%20de%20Calçadas.pdf>

ODAME, PRINCE KWAME; AMOAKO-SAKYI, R. O. Sidewalk accessibility and pedestrian safety among students with physical disability in the university of Cape Coast. **Current Research Journal of Social Sciences**, Vol. 02, No. (2), 15p., 2019. Disponível em: [https://www.researchgate.net/publication/338409885\\_Sidewalk\\_Accessibility\\_and\\_Pedestrian\\_Safety\\_among\\_Students\\_with\\_Physical\\_Disability\\_in\\_the\\_University\\_of\\_Cape\\_Coast](https://www.researchgate.net/publication/338409885_Sidewalk_Accessibility_and_Pedestrian_Safety_among_Students_with_Physical_Disability_in_the_University_of_Cape_Coast)

PIMENTEL, S.; PIMENTEL, M. C. Ressignificando a deficiência: a necessidade de revisão conceitual para definição de políticas públicas. **Revista Direitos Sociais e Políticas Públicas (UNIFAFIBE)** 5(2):1039, 2017. Disponível em: [https://www.researchgate.net/publication/322576259\\_reassignificando\\_a\\_deficiencia\\_a\\_necessidade\\_de\\_revisao\\_conceitual\\_para\\_definicao\\_de\\_politicas\\_publicas/link/61e5c0c68d338833e37694f7/download?\\_tp=eyJjb250ZXh0ijp7imzpcnn0ugfnzsi6inb1ymxpy2f0aw9uiiwi-cgfnzsi6inb1ymxpy2f0aw9uin19](https://www.researchgate.net/publication/322576259_reassignificando_a_deficiencia_a_necessidade_de_revisao_conceitual_para_definicao_de_politicas_publicas/link/61e5c0c68d338833e37694f7/download?_tp=eyJjb250ZXh0ijp7imzpcnn0ugfnzsi6inb1ymxpy2f0aw9uiiwi-cgfnzsi6inb1ymxpy2f0aw9uin19). Acesso em: 17/07/24. I S S N 2 3 1 8 - 5 7 3 2. DOI: <http://dx.doi.org/10.25245/rdspp.v5i2.258>

RODRIGUES, G. A. **Acessibilidade pedonal por meio de geotecnologias**. In: VII MOSTRA DE DOCENTES EM RJ1, de 30 a 31 de novembro, São Paulo, 2023. [Anais...] São Paulo: Centro Paula Souza. Disponível em: [https://www.fatecguaratingueta.edu.br/mostrarji/Anais-VII-MostrarJI/artigos/publicacao\\_112.pdf](https://www.fatecguaratingueta.edu.br/mostrarji/Anais-VII-MostrarJI/artigos/publicacao_112.pdf). Acesso em: 17/07/24

RODRIGUES, G. A.; CHICONATO, D. A. **Percepção da pessoa com deficiência física em relação à qualidade dos espaços pedonais**. In: SIMPOSIO DOS ENSINOS MÉDIO, TÉCNICO E TECNOLÓGICO: práticas docentes e criações discentes, 10º, 2023, São Paulo. [Anais]. São Paulo: Centro Paula Souza 2022. 10p. [www.simpotio.cpsctec.com.br](http://www.simpotio.cpsctec.com.br). Acesso em: 20/11/2023.

SÁNCHEZ, T. P. & JUSTICIA, D. L. Barreras de acceso al medio físico de los estudiantes con discapacidad motora de la Universidad de Granada. **Revista Electrónica de Investigación Psicoeducativa**, nº 7, vol. 3 (3) 2005, pp. 121 - 132. Disponível em: <https://dialnet.unirioja.es/servlet/articulo?codigo=1456314> ISSN: 1696-2095

SÁNCHEZ-SUÁREZ, Y.; SUÁREZ-MARTIN, R.; QUESADA-SOMANO, A. K.; MARQUÉS-LEÓN, M.; LEYVA-RICARDO, S. E. & SANTOS-PÉREZ, O. Estudio de la Infraestructura peatonal del centro histórico de la ciudad de Matanzas. **Ingeniería Industrial**, vol. XLIII/no. 1/enero-Marzo/2022/p.1-14. Disponível em: <http://scielo.sld.cu/scielo.php?script=sci-arttext&pid=S1815-59362022000100105>. ISSN 1815-5936.

SILVA, M. V. da; RODRIGUES, G. A.; PROENÇA, U. C. M. Avaliação pedonal do trecho oeste do corredor de acessibilidade do quadrante 2 da cidade de Taquaritinga-SP. **Interface Tecnológica**, v. 20, n. 2, p. 800-812, 2023. Disponível em: <https://revista.fatectq.edu.br/interfacetecnologica/article/view/1755>. Acesso em: 12/07/24. ISSN (On-Line) 2447-0864. DOI: 10.31510/inf.v20i2.1755

VASCONCELOS, L. R. & PAGLIUCA, L. M. F. Mapeamento da acessibilidade do portador delimitação física a serviços básicos de saúde. **Esc Anna Nery R Enferm**, dez; 10 (3): 494 – 500, 2006. Disponível em: <https://www.scielo.br/j/ean/a/t54GnxxRcHtF3vTn7yDWW3M/?lang=pt>. <https://doi.org/10.1590/S1414-81452006000300019>









## APPENDIX 1



Types of floor coverings experienced by wheelchair users on sidewalks

			
Rectangular cement block	Smooth marble	Machined concrete	Smooth stone and grass
			
Granite	Hexagonal cement slab (Block)	Portuguese mosaic	Straightened mortar
			
Rustic lathed concrete	Rough stone and marble		

## APPENDIX 2

Most common types of defects in sidewalk coverings experienced by wheelchair users

			
Hole with unevenness	Sharp bounce	Patches and holes	Hexagonal floor (block)
			
Mild depression (Concave)	Tree and hexagonal tile	Damages to more than 30% of the sidewalk in the longitudinal direction	Patches of different materials and convex textures

			
Uncovered sidewalk and presence of grasses	Severe breakdown and PV exposure (visiting point)		

### APPENDIX 3

Types of access ramps to sidewalks with different degrees of finish most common experienced by wheelchair users numbered 1 to 6.

		
1	2	3
		
4	5	6