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**PEDESTRIAN
ACCESSIBILITY OF THE
CENTRAL AISLE OF THE
CITY OF TAQUARITINGA,
SP, BRAZIL**

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Abstract: Even today, in the 21st century, people with motor disabilities still face various obstacles, of different natures, that limit their integration. To achieve equity, it is necessary to think about strategies ranging from physical and architectural barriers in pedestrian spaces, to cultural barriers, in order to facilitate universal access. By talking and listening to people with disabilities, it is possible to understand their difficulties and how accessibility is still an obstacle to ensuring inclusion, highlighting the lack of investment in sidewalk covering materials, repairs of structural defects that generate common obstacles, in addition to absence of access ramps in urban pedestrian spaces. Therefore, the objective of this study was to diagnose accessibility conditions for people with disabilities in the commercial center of the city of Taquaritinga-SP. The methodology used was the mapping of pedestrian spaces regarding the types of coverings and common defects in sidewalks and the presence or absence of access ramps for people with physical disabilities or reduced mobility, using satellite images. The results showed that the majority of intersections do not have access ramps for people who use wheelchairs or other auxiliary equipment, to fully move around pedestrian spaces in the region under study. The quality of the sidewalk covering materials was considered “good”, with the predominance of the “Portuguese mosaic” material.

Keywords: Pedestrian accessibility. Physical disability. Street furniture.

INTRODUCTION

For the full development of a location, considering the principle of “smart cities” – committed to urban development from a sustainable and inclusive perspective, factors such as accessibility must be put on the agenda. Urban growth and mobility are intrinsically

related, considering that improving traffic and taking care of the spatial configuration of cities are factors that contribute to the equity of a population (GODOY et al. 2023). Therefore, accessibility must be thought of broadly so that it truly contributes to the population's quality of life and, in addition, is in line with human rights (RIBEIRO et al., 2020).

According to Sasaki (2003), for accessibility to be fully met, it is necessary to consider physical and architectural, communicational, methodological, instrumental, programmatic and attitudinal accessibility. Therefore, when considering equity between people with and without disabilities, it is necessary to start from the assumption that accessibility must be thought of as a benefit that reaches a wide range of the population, and when carried out from the beginning of a project it costs less than the adaptations made later (RIBEIRO *et al.*, 2020).

Law 12,587/12, which deals with Urban Mobility and aims to serve and integrate the city's diverse users, with their singularities, capabilities and limitations, sets out the following principles that underpin the National Urban Mobility Policy (PNMU):

I — Universal accessibility; II-Sustainable development of cities, in the socioeconomic and environmental dimensions; III-Equity in citizens' access to collective public transport; IV-Efficiency, efficacy and effectiveness in the provision of urban transport services; V-Democratic management and social control of planning and evaluation of the National Urban Mobility Policy; VI-Safety in people's movements; VII-Fair distribution of benefits and burdens arising from the use of different modes and services; VIII-Equity in the use of public circulation space, roads and public spaces; and IX-Efficiency, effectiveness and effectiveness in urban circulation. (BRAZIL, 2012).

At the beginning of the 21st century, Sánchez & Justicia (2005) reported that people with motor disabilities continue to struggle

against different obstacles that impede their integral social development. To achieve equity, people with physical disabilities have to overcome enormous difficulties, ranging from facing physical and architectural barriers to cultural barriers. These authors mention that the best way to verify and demonstrate the mobility and accessibility difficulties of these people is to observe the surroundings of the access roads, especially next to a person with a physical disability, in order to highlight and note each of the obstacles encountered. In this sense, the analysis of the different types of architectural barriers allows us to distinguish between:

- Urban architectural barriers: these are those found on roads and public spaces, sidewalks, steps at different levels, obstacles on public roads, parks and inaccessible gardens:
- Architectural barriers in buildings: these are those found inside buildings, stairs, steps, corridors, reduced elevators, etc.
- Transport barriers: those found in different means of transport, inaccessibility to public transport, difficulties in parking private transport (SÁNCHEZ & JUSTICIA, 2005).

The urban planning of Brazilian cities was strongly influenced by the model and philosophy of European urbanism and economic segregation. Sánchez & Justicia (2005) evaluated the answers to a questionnaire from 23 students enrolled in the year 2003/04 at the ``Universidad de Granada``, Spain, addressing the topic of accessibility and social inclusion. The results showed that regarding barriers to accessing the library, 47.8% completely agree and 17.4% agree that access to the library is appropriate for their disability, while 26.1% disagree. In the item access to the party room, as with the item referring to access to the library, the majority of interviewees (47.8% and 34.8%) consider the item to be very appropriate. Regarding

access to the cafeteria, the entrance is another aspect with which university students with disabilities express their agreement (60.9% strongly agree / 17.4% agree). The authors further report that:

- Regarding the adequacy of the classrooms: 26.1% expressed that the layout of the classrooms does not allow them to follow classes comfortably; 30.4% (totally agree) and 34.8% (agree), on the other hand, state that the classrooms are adequate to monitor the development of classes.

- Regarding the adequacy of public transport: 26.1% (totally agree) and 26.1% (agree) of students expressed that public transport adapts to their needs, 30.4% demand an improvement in this type of transport (SÁNCHEZ & JUSTICE, 2005).

To facilitate the movement of people with physical disabilities, one option is to give priority to pedestrians and encourage pedestrian circulation in urban centers. Therefore, it is essential to design cities in which walking is feasible for the majority of necessary urban journeys, that is, where short distances predominate, as is the case in cities such as Venice or Copenhagen (VALENTE, 2009). This author also reports that it is true that each environment has specific points that require studies to find the most appropriate solutions. It is essential to establish a “pedestrian city”, especially in developing areas, where the issue of walking distance or the layout of suitable pedestrian routes can be streamlined. In historic cities, it is more difficult to guide pedestrians in consolidated areas. To this end, it is necessary to promote special intervention programs that encourage walking and that can encompass different types of actions, from improving pedestrian path networks in relation to road networks, to the occasional use of mechanical pedestrian support systems. About these cases:

The historic centers of several European cities

face serious problems that threaten their survival. These regions, the result of ancient urbanization, where the urban infrastructure was designed around pedestrian travel, are characterized by their fragility in terms of the road network, accentuated by the intense and exacerbated use of vehicles. The problem is common in many European cities and the solution basically consists of finding the appropriate balance between the preservation of the historic center and the necessary urban development in the city, as well as reconciling the needs of automobile and pedestrian traffic (VALENTE, 2009).

The demands of a contemporary society include themes focused on the so-called “social minorities”, a nomenclature that is not directly related to quantity, but in terms of vulnerability, that is, people who do not fit into an imposed standard, such as the elderly and disabled (RAMACCIOTTI & CALGARO, 2022). To this end, attention must be paid to the perception of accessible pedestrian routes, which must be continuous, unobstructed or free from physical barriers that connect to other urban elements in an equitable way, without the same type of obstacles and that comply with the present standards of each country.

Accessibility was, for a long time, seen solely as a need for people with disabilities. This concept was reductive and in a way a manifestation of the exclusion to which people with disabilities are subject. It was then considered that existing cities, buildings and objects of daily use were the origin of exclusion, not only for a high percentage of people with disabilities, but also for the elderly and children (GIL, 2009). Thus, from the perspective of social equality, the concept of Design for All emerges. Valente (2009) further argues that obstacles are all impediments that complicate, limit, loosen or impede the autonomy of movement of confined people, their free movement in public or private places, outdoors, indoors or the use of public

services. The main obstacles are:

“Urbanistic — are those that exist on public roads as well as in spaces for public use; Architectural — are those existing at the entrances and inside buildings, both public and private; Sensory — are all impediments that make it impossible or difficult to express or receive messages through the media, whether mass media or not; Transport — those existing in the means of transport.” (VALENTE, 2009).

According to Araújo (2013), the 1988 Brazilian constitutional text addresses the issue of disability by centering the issue on the principle of equality. This equality is translated into several provisions, in addition to the generic rule of equality, present in art. 5th of the Constitution. The rule would be enough to guarantee formal equality, that is, equality before the law. However, the constituent preferred to make it clear and highlight the rule of equality for people with disabilities. In this step, in item XXXI of art. 7th, guarantee the “prohibition of any discrimination regarding salary and admission criteria for workers with disabilities”.

Other provisions of the Federal Constitution were intended to protect this group. The art. 208, item III, granted special treatment to people with disabilities, guaranteeing specialized educational assistance, preferably in the regular education network. The same happened with social assistance, as provided in art. 203, in its section IV, which aims to qualify and rehabilitate these people and promote their integration into community life, as well as in section V, which guarantees a minimum wage monthly benefit to people with disabilities who prove that they do not have means of providing for one's own maintenance or having it provided for by one's family, in accordance with the law. This material equality is also protected in art. 37, item VIII, which guarantees the reservation of vacancies for people with disabilities in

public jobs and positions. Accessibility – a fundamental instrumental right (exists so that other rights can be exercised) is guaranteed in articles 227, § 2 and 244, which provide for construction standards for public spaces and buildings for public use and the manufacture of public transport vehicles are provided for by law, in order to guarantee adequate access for people with disabilities.

Aiming to guarantee and promote conditions of equality, exercise of fundamental rights and freedoms of this group of people, Law 13,146/2015 established the Brazilian Law for the Inclusion of Persons with Disabilities (Statute of Persons with Disabilities), in which a person with a disability or people with reduced mobility have the right to transport and mobility, ensuring equal opportunities through the identification and elimination of all obstacles and barriers to their access. In its Article 3, for the purposes of applying this Law, the following are considered:

I — Accessibility: possibility and condition of reach for use, safely and autonomously, of spaces, furniture, urban equipment, buildings, transport, information and communication, including their systems and technologies, as well as other services and facilities open to the public, for public or private use, for collective use, both in urban and rural areas, by people with disabilities or reduced mobility;

II — Universal design: design of products, environments, programs and services to be used by all people, without the need for adaptation or specific design, including assistive technology resources;

III — Assistive technology or technical aid: products, equipment, devices, resources, methodologies, strategies, practices and services that aim to promote functionality, related to the activity and participation of people with disabilities or reduced mobility, aiming at their autonomy, independence, quality of life and social inclusion;

IV — Barriers: any obstacle, obstacle, attitude or behavior that limits or prevents a person's social participation, as well as the enjoyment, enjoyment and exercise of their rights to accessibility, freedom of movement and expression, communication, access to information, understanding, safe circulation, among others, classified into:

a) urban barriers: those existing on roads and in public and private spaces open to the public or for collective use;

b) architectural barriers: those existing in public and private buildings;

c) transport barriers: those existing in transport systems and means;

d) barriers in communications and information: any obstacle, obstacle, attitude or behavior that makes it difficult or impossible to express or receive messages and information through communication and information technology systems;

e) attitudinal barriers: attitudes or behaviors that prevent or harm the social participation of people with disabilities on equal terms and opportunities with other people;

f) technological barriers: those that hinder or prevent people with disabilities from accessing technologies (BRASIL, 2015).

Vasconcelos & Pagliuca (2006) studied the reality of accessibility for people with physical disabilities to health services. The research had an exploratory-descriptive nature with a quantitative approach to understand reality and provide support for possible intervention. As for the universe of this study, it is made up of Basic Health Services. The intentional geographic sample was made up of a medium-sized city in Ceará, which has a population, estimated by IBGE, in 1998, of 143,762 inhabitants. These authors found that of the 12 locations evaluated, none had sidewalks free of holes and unevenness. Differences in the ground of streets and avenues adjacent

to health establishments, in most locations (10), also hampered the traffic of people with physical limitations, in addition to other impediments to passage, such as bar chairs, furniture in general, and inadequate passage width.

Mobility is one of the most important themes regarding the management of a city, being a set of living relationships that represents one of the fundamental factors for economic development, social inclusion and social equity (TEIXEIRA, TAVARES & MACHADO, 2022). In this aspect, these authors aimed to change the city's perspective on pedestrians and how the city's urban development is arranged, to reorganize the city's road design. The results obtained indicate that the studied region is not properly suited for the people who use it. Furthermore, they found that the physical space (widths and obstructions) and intersections (modal division and safety) are the factors that most contribute to the poor quality of the space.

Based on the above, supervisory action in public space is of fundamental importance when it comes to maintaining the quality of floors, some interference with the circulation and stopping of vehicles, expanding the sidewalk area and increasing the safety of pedestrian spaces. The objective of this study was to diagnose accessibility conditions for people with physical disabilities and reduced mobility in the commercial center of the city of Taquaritinga-SP.

MATERIAL AND METHODS

STUDY AREA

This work was carried out in the central area of the municipality of Taquaritinga, SP, under coordinates Latitude 21° 21' 55.42''S and Longitude 48° 33' 48.26''O (Figure 1). The region's climate is classified as hot-summer humid mesothermal (Cwa). The

main soil unit is classified according to the soil study map of the State of São Paulo, according to Oliveira *et al.* (1999) as Argisols and the original vegetation is composed of the Tropical Latifoliate Forest.

compared to other municipalities in the state, it is ranked 173 out of 645, 278 out of 645 and 338 out of 645, respectively. When compared to other cities in Brazil, its position is 225 out of 5570, 726 out of 5570 and 1706 out of 5570, respectively (IBGE, 2010). Taquaritinga has a territorial area of 594,335 km², belongs to the Mesoregion of Ribeirão Preto, Intermediate Region of Araraquara and the Microregion of Jaboticabal, the unit's region.



Figure 1. Mute map of the city of Taquaritinga-SP

Source: www.ibge.cidades.gov.br(2010);
Municipality limits in green outline.

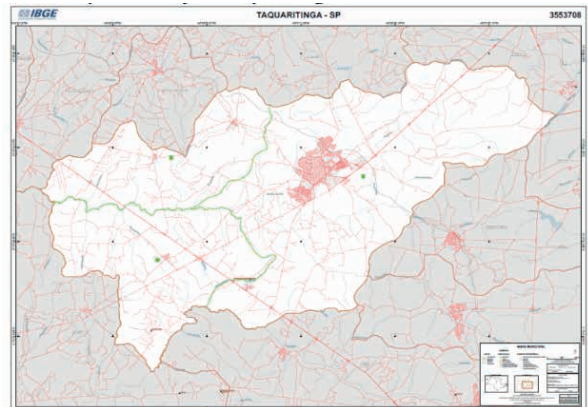


Figure 2. Statistical map of the city of Taquaritinga-SP

Source: www.ibge.cidades.gov.br (2010)

Taquaritinga has a population of 53,988 inhabitants (IBGE, 2010), with a demographic density of 90.95 inhabitants/km² (Figure 2) and an average monthly salary of formal workers of 2.1 minimum wages (2020), employed personnel (2020) of 12,585 people, the percentage of the population with nominal monthly per capita income of up to 1/2 minimum wage (2010) is 30.1%, and the schooling rate for 6 to 14 years (2010) is 98.2%.

The average infant mortality rate in the city is 12.52 per 1,000 live births. Hospitalizations due to diarrhea are 1.8 per 1,000 inhabitants. Compared to all municipalities in the state, it is ranked 190 out of 645 and 74 out of 645, respectively. When compared to cities across Brazil, these positions are 2187 out of 5570 and 1659 out of 5570, respectively. It presents 94.5% of homes with adequate sewage, 96.1% of urban homes on public roads with trees and 21.9% of urban homes on public roads with adequate urbanization (presence of drains, sidewalks, paving and curbs). When

METHODOLOGY

The methodology of this study was adapted following the technique used by Rodrigues, Ferrarezi and Bovério (2020), who in the urban space used geotechnological resources from the free access software *Google Earth Pro*, and satellite image comparison technique according to Ongaratto and Rocha (2013). The object of study of the city of Taquaritinga-SP refers to the central area of the city, limited by parallel public roads, as shown in Figure 2: in blue “A” identifies the corridor relating to Rua Campos Sales; in blue “B” identifies the corridor relating to the central street Prudente de Moraes; in blue “C” identifies the corridor relating to Rua Treze de Maio; in blue “D” shows the profile cut and elevation of the ground and, in white “TS”: upper third of the corridor; “TM”: middle third of the corridor

and “TI”: lower third of the corridor.

To begin demarcating the urban area, it was necessary to divide it into 4 quadrants (Q1, Q2, Q3 and Q4) with north-south and east-west lines, forming a right angle (Figure 3). To carry out this practice, we used the tool on the top tab called “path”. Next, the “marker” tool was used to identify the quadrants of the district in an urbanized area. To demarcate the accessibility mapping area, the “polygon” tool was used, which allows you to accurately measure the perimeter and area, and for the construction of straight or winding lines, the “path” tool was used, and with this issue, the map is manually constructed.

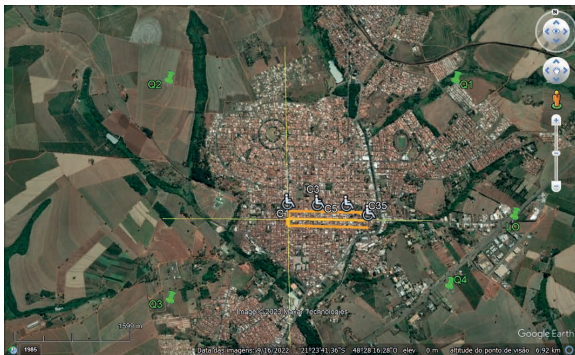


Figure 3. Map of the urban area of the city of Taquaritinga detailing the city’s quadrants.

Source: Prepared by the authors (2023); in yellow the North-South and East-West transects; in green the identification of the quadrants of the urban area; in orange the accessibility polygon in the central region of the city of Taquaritinga-SP

The perimeter of the central aisle polygon is 7.1 km, while the respective area is 3.82 hectares. The three corridors make up 36 intersections between public roads in this study region, that is, 144 corners. The highest point of the corridors is 576 m above sea level (Figure 4), while the lowest area is 533 m above sea level. The slope of the roads mentioned varies from 1.6% to 8.0%, and an average slope of the three corridors is 4.6%, with an average length of each corridor of 1.13 km.

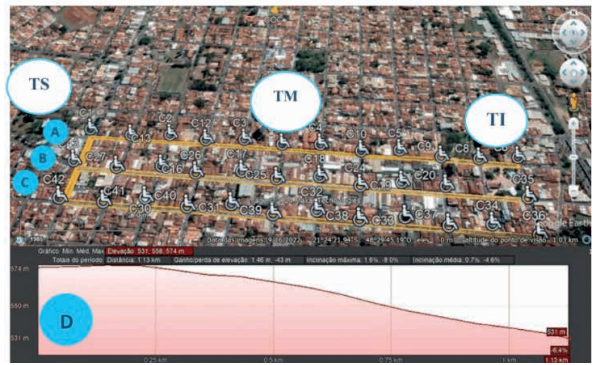


Figure 4. Longitudinal corridors of the urban area of the city of Taquaritinga-SP

Source: Prepared by the authors (2023); in orange the central longitudinal corridors of the city of Taquaritinga-SP; in blue “A” identifies the corridor relating to Rua Campos Sales; in blue “B” identifies the corridor relating to the central street Prudente de Moraes; in blue “C” identifies the corridor relating to Rua Treze de Maio in the city of Taquaritinga-SP; in blue “D” shows the profile cut and ground elevation; TS: upper third of the corridor; TM: middle third of the corridor; IT: lower third of the corridor

To identify each intersection of public roads, the “street view” tool was used, which allows the visualization of urban space 3 meters from the ground, at which point the corners of the respective intersection are photographed, resulting in at least 2 image captures, paying attention to the presence of accessibility ramps for disabled people, type of sidewalk covering and walkability conditions, that is, the main sidewalk defects from the perspective of people with physical disabilities (incarcerated people). Once the images are captured, an image database is formed, which will be inserted into each marker corresponding to that road intersection. A minimum of 280 images in “JPG” format are assumed, which will be inserted into the markers by accessing “insert images of location”. Once the accessibility polygon has been determined, the marked intersections have been identified,

photos have been inserted at each marker, a spreadsheet will be generated with commercial software, which will identify in ascending order, for each marker, the geographic latitude and longitude, latitude and longitude in Universal Transversor of Marcatur (UTM), the azimuths, the distances between each marker and, finally, the perimeter and area of the accessibility polygon.

Numerical data were generated in relation to the quality of access ramps to sidewalks, following the Likert scale (1935), represented as follows: 1-absence of ramp or poor quality; 2-regular, 3-good, 4-excellent and 5-excellent. The scale was generated from a visual aspect, following research with people with physical disabilities, carried out by Rodrigues and Chiconato (2023). The same evaluation logic will be in relation to sidewalk coverings and the most common defects experienced by people included in these corridors, respectively.

RESULTS AND DISCUSSION

The first point on accessibility measured was in the region of the upper third of the corridor, as shown in Figure 5. It is clearly noted that there is an access ramp, but favoring a commercial company, and not positioned on the corner to allow access in the direction longitudinal of the sidewalk. It is also noted that the ground signage needs to be adapted. The results showed that the studied region does not have adequate conditions for the imprisoned people who use it. Furthermore, analyzing the data individually, it is concluded that their physical space (widths and obstructions) and intersections (modal division and safety) are the factors that most contribute to this poor quality of space.

At the third assessment point, the upper part of the central aisle, it is noted that there is only a modest access ramp just facilitating access to the commercial house, with no such adjustments being made on other corners

(Figure 5)

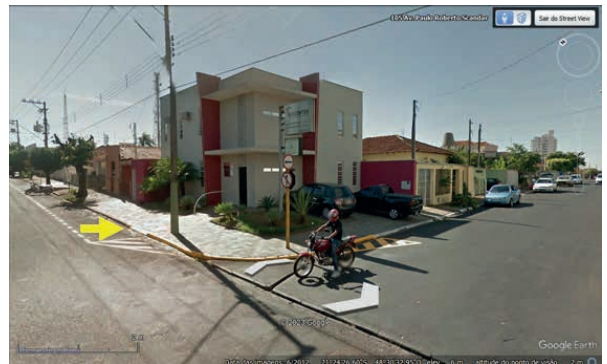


Figure 5. View of one of the corners of Av. Paulo Roberto Scander, upper part of the accessibility corridor in the city of Taquaritinga-SP

Source: organized by the authors (2023); Yellow arrow indicating a modest access ramp for detained people.

It can be seen, in Figure 6, that there is no access ramp for wheelchair users and very reduced ground signage and sidewalks with modest width.



Figure 6. View of two corners of Rua Campos Sales, upper part of the accessibility aisle in the city of Taquaritinga-SP.

Source: organized by the authors (2023); Yellow arrow indicating a modest access ramp for detained people

In Figure 7, in A and B, there is a contrast that is quite common on public roads. One side has a modest access ramp (Yellow Arrow-A) and in the same space there must be other ramps to allow adequate movement of confined people. It is worth noting that ground signs seem to be more intense in the central region of the city.



Figure 7. View of two corners of Rua dos Domingues, lower part of the accessibility corridor aisle in the city of Taquaritinga — SP.
Source: organized by the authors (2023); Yellow arrow indicating a modest access ramp for detained people

In Figure 8, central region and close to the city's City Hall, something very common on public roads in Taquaritinga is observed, the presence of obstacles that hinder the movement of confined people (yellow arrow in B). Note also the absence of access ramps (yellow arrow in A) in a region with intense pedestrian movement, less than 200 meters from the city administration headquarters (City Hall) and the City Council.

NBR 9050:2020 very clearly highlights the concern with furniture on the accessible route

for trapped people or pedestrians. Furniture with a height between 0.60 m and 2.10 m from the floor may pose risks to people with visual impairments, if they have projections more than 0.10 m deep.



Figure 8. View of two corners of Rua Rui Barbosa, lower part of the accessibility corridor aisle in the city of Taquaritinga — SP.

Source: organized by the authors (2023); Yellow arrow indicating a modest access ramp for detained people

In Figure 9, the middle region of the Taquaritinga accessibility corridor, there is good signage on the ground, however, a clear and very common inconsistency: an access ramp for restricted people (yellow arrow) and on the opposite side of access at the intersection, the absence access ramp for detained people (red arrows). Situations like these observed in the city of Taquaritinga were also corroborated by Godoy *et al.* (2023), in a city with a smaller number of inhabitants (Dobrada-SP), where both in the central region of the city and in the neighborhood region, there was no infrastructure for accessibility ramps for people with physical disabilities or reduced mobility.



Figure 9. View of two corners of Rua da República, middle part of the accessibility corridor aisle in the city of Taquaritinga — SP.

Source: organized by the authors (2023)

It can be seen in Figure 10 and Figure 11, the middle part of the central accessibility corridor of Taquaritinga, the presence of an access ramp without proper signage as characterized by the standard. This fact is repeated at most intersections in the aforementioned corridor under study.



Figure 10. View of two corners of Rua da República, middle part of the accessibility corridor aisle in the city of Taquaritinga — SP.

Source: organized by the authors (2023); Red arrow indicates accessibility ramp without painting indicating accessibility standard.

It can be seen, in Figure 11, that the pedestrian space is divided with other urban elements, such as lighting posts, traffic signs and traffic lights, reducing the space for the movement of people with physical disabilities or reduced mobility, since the Pedestrian

space considers the movement of people, whether closed or not, in both directions.

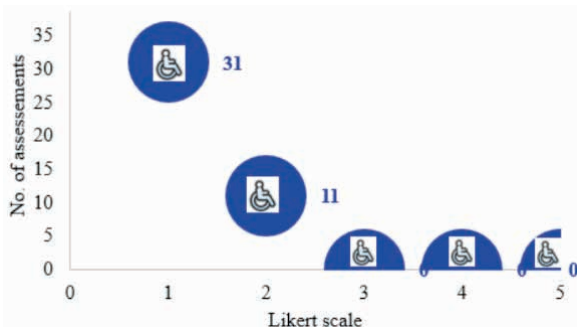


Figure 11. View of two corners of Rua São José, middle part of the accessibility corridor aisle in the city of Taquaritinga — SP.

Source: organized by the authors (2023); red arrow indicating accessibility ramp without indicative painting.

The survey of the visual quality conditions of the access ramps for people confined in the city of Taquaritinga-SP was evaluated at 44 points in the corridors, as shown in Graph 1. The evaluations were based visually according to data from Rodrigues and Chiconato (2023), where in such work the visual conditions of people isolated from a large part of Brazil were manifested. It is noted that the majority of intersections in the accessibility corridor proposed for the city of Taquaritinga-SP received an evaluation between poor (31) and regular (13). It is worth remembering that the “terrible” evaluation includes the absence of ramps, an insufficient number or poor construction quality.

| Scale | |
|-------|-----------|
| 1 | Terrible |
| 2 | Regular |
| 3 | Good |
| 4 | Very good |
| 5 | Great |



Graph 1. Conditions of the access ramps at the Commercial Center of Taquaritinga-SP
Source: Prepared by the authors (2023)

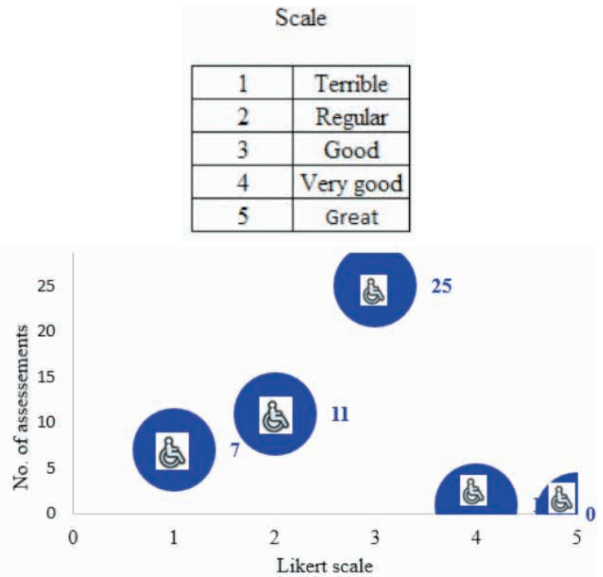
It would be expected to have two ramps on each corner. What was actually observed is that in very few cases there was at most 1 ramp, on corners on the same side of the road, as shown in Figure 11, directing the movement of the trapped person in a diagonal direction and not in a straight direction with the ground signage. (Crosswalk).

The results of this study are in accordance with Godoy *et al.* (2023), which uses the same techniques as satellite images to assess the accessibility of urban spaces. They found that the critical point on the external side of urban spaces lies in the lack of accessibility ramps to allow the free movement of confined people. Another important point verified by these authors is the narrow width of the sidewalks, which are occupied by urban furniture, such as trees, electrical poles, signposts, trash cans, etc., and the defects in the covering of the sidewalks well addressed by Rodrigues and Chiconato (2023), which imposes an additional difficulty for pedestrians and stranded people.



Figure 12. View of two corners of Rua São José, middle part of the accessibility corridor aisle in the city of Taquaritinga — SP.

Source: Prepared by the authors (2023); yellow arrow indicates the presence of an accessibility ramp without indicative painting; Green arrow indicates the type of coating called “Portuguese mosaic”.

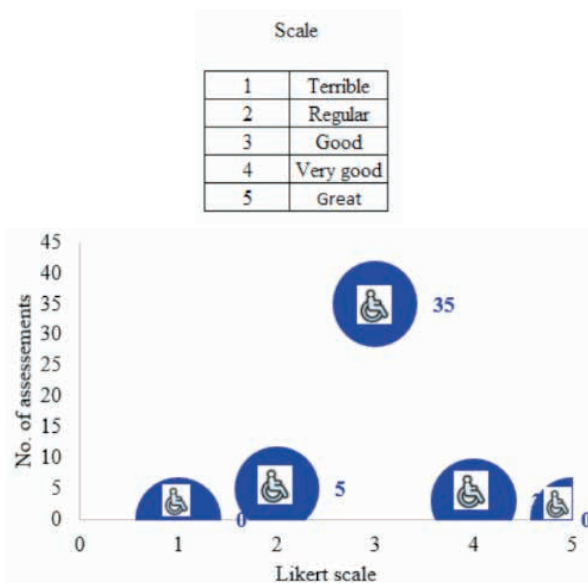


Graph 2. Conditions of the sidewalks for accessibility to the Commercial Center of Taquaritinga-SP

Source: Prepared by the authors (2023)

When evaluating the most common defects in sidewalks, according to Rodrigues and Chiconato (2023), they found that the central sidewalks in the city of Taquaritinga-SP had a classification considered good (Graph 3). And what can still be seen is that there is a predominance of the type of sidewalk

coating called “Portuguese mosaic” in the region under study, followed by coating with straightened mortar (green arrows, Figure 12). The Portuguese mosaic, originating from 7 cm cubes of rocks in black (basalt, granite), white, yellow and pink. This sidewalk covering provides good traction for people who use wheelchairs. However, there are small bumps when walking on the covering, causing some discomfort for those trapped. Such observations were corroborated in the reports verified by Godoy *et al.* (2023).

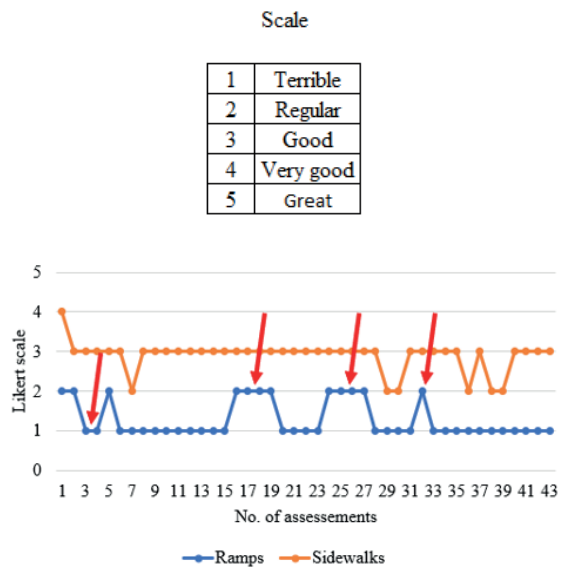


Graph 3. Most common defects on the sidewalks of accessibility to the Commercial Center of Taquaritinga-SP

Source: Prepared by the authors (2023)

In this work, it was also possible to verify the relationship between quality of ramps and defects in hunting, according to Rodrigues & Chiconato (2023). The points represented by the red arrows in Graph 4 seem to demonstrate that even though the quality of the access ramps for confined people was improved, the scale that represents the most common sidewalk defects was maintained, denoting an importance for confined people in relation to the most common defects. that interfere with the walkability of those with physical

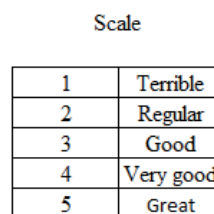
disabilities or reduced mobility.

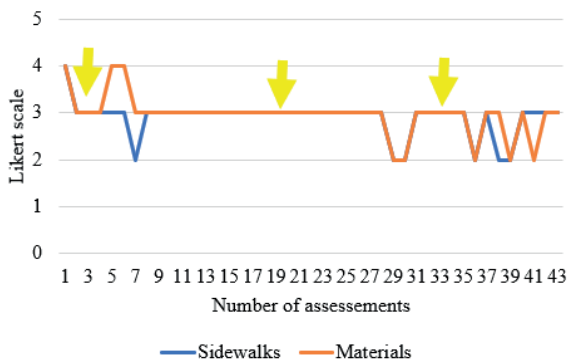


Graph 4. Relationship between ramp quality and hunting defects

Source: Prepared by the authors (2023); Red arrows indicate points that show independence of the variations that occurred in relation to the perception of the quality of the ramps.

Graph 5 allows us to infer an intimate relationship between the most common defects in hunting and types of materials considered more suitable, as observing the points represented by the yellow arrows, the scale was considered “good” for the two parameters already mentioned, similar to the results verified by Godoy *et al.* (2023).





Graph 5. Relationship between the most common defects in hunting and types of materials considered more appropriate

Source: Prepared by the authors (2023); Yellow arrows indicate the convergence between common sidewalk defects and types of sidewalk surfacing materials.

This study reflects a common situation in different Brazilian cities and even abroad. The findings of this study agree with Sanches & Justicia (2005) and Gil (2009) regarding the most common urban barriers in cities for the free movement of people enclosed in pedestrian spaces, which is also corroborated by Law 13,146 with regard to barriers urban planning. In the corridor under study in the city of Taquaritinga, it is very clear the difficulty that stranded people have to compete for space with lamp posts, trash cans, traffic signposts, traffic lights and, what is more severe, is the rarefied number of ramps. access at intersections, in different directions. Ground signage for vehicle and pedestrian traffic is well structured in the region of the accessibility corridor under study, based on visual observations at the 43 points evaluated.

Al-Taesh&Ujma-Wasowicz(2021),through questionnaires with professional marathon runners who had some type of physical disability, found that in the interviewees' perception of important pavement surfaces (Likert scale, from 1 to 5), and that must be avoided in a running environment, more than 85% of runners with disabilities agreed that

the type of street pavement is important for runners' performance. Irregular and potholed floors were identified as negative by 32.72% of runners. They also addressed the importance of lighting and flat surfaces, curb pavements, ground signage, among others. These elements or part of them may have a negative impact on the organization of a race for runners with physical disabilities. Therefore, there is a need for public managers to think about the most different types of users of pedestrian spaces, which must be part of all projects involving urban architecture.

As shown in the Accessible Sidewalk Manual (2019), the ideal sidewalk is one that guarantees the movement of anyone, regardless of their physical conditions or limitations, to any place with autonomy and safety. To achieve this, the sidewalk must have qualities such as adequate width, safety, continuity, adequate inclination, lighting, adequate paving, drainage, urban furniture, ramps and the spatial organization of the sidewalk.

Ideal sidewalks must meet the requirements set out in the accessibility standards available in Brazil, that is, NBR 9050 (ABNT, 2015; ABNT, 2020) and NBR 16537 (ABNT, 2016), which laid the foundations for construction of the ideal sidewalk in the recent past, questions that could be applied to new developments in urban centers in conditions of expansion or revitalization. However, in the present study, some disagreements with the aforementioned standards were observed, lack of ramps in the pedestrian flow and discontinuity of the pedestrian crossing, and non-uniformity in the paving. Other studies demonstrated a lack of compliance with NBR 9050. Buriti et al. (2019), analyzing the accessibility of public buildings and sidewalks in the center of Campina Grande (PB), found the same irregularities as those mentioned in this study, in addition to ramps with an inclination of up

to 15.6% above the maximum allowed by NBR 9050, that is, 8.33%. Study on accessibility in three municipal and state schools in the municipality of Araruna (PR), analyzing NBR 9050, indicated 62%, 55% and 49% of non-compliance with the aforementioned standards (SOUZA, 2022).

The reports of this study are in line with recent results by Godoy *et al.* (2023), which in a pioneering study in a city of approximately 9000 inhabitants, both in the central region of the city (Dobrada-SP), and in the neighborhood region, is devoid of infrastructure of accessibility ramps for people with physical disabilities or reduced mobility. Obstacles on sidewalks, such as lampposts, trash cans, traffic signs, street vendors, etc., represent an additional aggravating factor for any citizen's movement.

The sidewalks in the corridor aisle of the city of Taquaritinga-SP are far from ideal, but were considered good in this study. However, they disagree with the reports of Castro, Camargos & Farias (2020), in which "*Urban Barriers*" represent indifference to the need to adapt pedestrian spaces for people with disabilities, with regard to urban planning devices and public transport. These authors also reinforce that accessibility barriers not only make mobility difficult, but in a certain way negatively influence inclusion and increase the insecurity of family members of people with disabilities.

CONCLUSION

There is an urgent need to adapt pedestrian spaces in the commercial center region of Taquaritinga-SP. Initially, the adaptation must mainly involve accessibility ramps for confined people, at intersections in the region of the accessibility corridor aisle under study. The majority of intersections do not have

access ramps for people who use wheelchairs or other auxiliary equipment, so that they can move around in pedestrian spaces. The quality of the sidewalk covering materials in this study was considered "good", with the predominance of the "Portuguese mosaic" material. This study also indicates that public authorities were much more concerned with the adequacy of sidewalks than with the presence of accessibility ramps and, at the same time, there was a convergence towards a more harmonious relationship between the type of sidewalk materials and the presence of defects. most common on sidewalks in the commercial center of Taquaritinga-SP.

At the same time that these difficulties were identified, this study does not exhaust the possibilities of intervention to improve urban space, especially when it comes to allowing accessibility for citizens with some type of physical disability. Thus, other studies could also analyze the relationships between the conditions of the asphalt pavement and accessibility ramps, water drainage ditches, speed bumps and other obstacles present on the streets, in addition to ground signage and high-relief coverings on sidewalks for the visually impaired.

Social inclusion occurs when there are favorable conditions for the coexistence of all citizens and accessibility devices contribute to this task. It is everyone's duty to monitor and demand public entities to use resources correctly to create a more harmonious urban environment for the benefit of all.

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REFERENCES

- ABNT - ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. NBR 9050: Acessibilidade e edificações, mobiliário, espaços e equipamentos urbanos. Rio de Janeiro, 2015.
- ABNT - ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. NBR 16537: Acessibilidade – Sinalização tátil no piso – Diretrizes para elaboração de projetos e instalação. Rio de Janeiro, 2016.
- ABNT - ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. Acessibilidade a edificações, mobiliário, espaços e equipamentos urbanos. NBR 9050:2020, 4ª., ed., Rio de Janeiro, 03.08.2020.147p. ISBN 978-65-5659-371-5
- AGYEMAN, L. O. Mobility as a basic human right: a situated understanding of mobility among persons with physical disabilities in rural talensi district, Ghana. **Research Square**, 2023. Disponível em: <https://www.researchsquare.com/article/rs-2234162/v1>.ISSN 2693-5015 (online). <https://doi.org/10.21203/rs.3.rs-2234162/v1>
- AL-TAESH, N.; UJMA-WASOWICZ, K. Introducing the Physical Barriers in the City In-Between Buildings for Disabled Runners. **Current Urban Studies**, v.9, p.554-573, 2021. Disponível em: <https://www.scirp.org/journal/cus>. ISSN Online: 2328-4919. ISSN Print: 2328-4900. DOI: 10.4236/cus.2021.93033
- ARAÚJO, L. A. D. A Proteção das Pessoas com Deficiência na CF 88: a necessária implementação dos princípios constitucionais. **Textos para discussão**, Vol. V, 16/maio, 2013. Disponível em: <https://www12.senado.leg.br/publicacoes/estudos-legislativos/tipos-de-estudos/outras-publicacoes/volume-v-constituicao-de-1988-o-brasil-20-anos-depois.-os-cidadaos-na-carta-cidada/idoso-pessoa-com-deficiencia-crianca-e-adolescente-a-protacao-das-pessoas-com-deficiencia-na-cf-de-88-a-necessaria-implementacao-dos-principios-constitucionais>.
- BRASIL. Constituição da República Federativa do Brasil de 1988. Disponível em: https://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm
- BRASIL. Política Nacional de Mobilidade Urbana. Lei n.º 12.587, de 03 de janeiro de 2012.
- BRASIL. Lei Brasileira de Inclusão da Pessoa com Deficiência (Estatuto da Pessoa com Deficiência). LEI n.º 13.146, DE 6 DE JULHO DE 2015. Disponível em: https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2015/lei/l13146.htm
- BURITI, A. A., DOS SANTOS, Y. R. A., DANTAS, A. B. L., & DA SILVA, M. L. R. Avaliação da acessibilidade em prédios públicos e passeios do centro de campina grande-PB com base na NBR 9050. Disponível em: https://www.editorarealize.com.br/editora/anais/cieh/2019/TRABALHO_EV125_MD1_SA12_ID2564_27052019105401.pdf. Acesso em 4 jul de 2023.
- CASTRO, G. G. de; CAMARGOS, A. S.; FARIAS, M. S. Barreiras de acessibilidade urbana: cotidiano das famílias de crianças com deficiências neurológicas. Disponível em: **Rev. Fam., Ciclos Vida Saúde Contexto Soc.**, REFACS (online), jul/Set, 2020; 8(Supl. 2). <https://www.redalyc.org/journal/4979/497965721004/html/>. ISSN: 2318-8413.DOI: 10.18554/refacs.v8i0.4744
- GIL, B. E. D. **Mobilidade pedonal no espaço público: caso de estudo e aplicação ao projeto em Sete Rios**. 2009. 59p. (Dissertação de Mestrado), Instituto Superior Técnico, Universidade Técnica de Lisboa, Portugal, 2009.
- GODOY *et al.* (2023) Acessibilidade pedonal na cidade de Dobrada-SP, Brasil. *In: CAVALCANTI, Soraya Araújo Uchoa. Inclusão e contexto social: agenda contemporânea*. Org. Ponta Grossa, PR: Atena, 2023. Pág.62-82. Disponível em: <https://www.atenaeditora.com.br/catalogo/ebook/inclusao-e-contexto-social-agenda-contemporanea>.ISBN978-65-258-1624-1. DOI:<https://doi.org/10.22533/at.ed.241230808>
- LEMOS, C. de O. Crianças e Adolescentes: a constituição de novos sujeitos de direitos. **Estudos legislativos**, vol. V, 16 de maio, 2013. Disponível em: <https://www12.senado.leg.br/publicacoes/estudos-legislativos/tipos-de-estudos/outras-publicacoes/volume-v-constituicao-de-1988-o-brasil-20-anos-depois.-os-cidadaos-na-carta-cidada/idoso-pessoa-com-deficiencia-crianca-e-adolescente-criancas-e-adolescentes-a-constituicao-de-novos-sujeitos-de-direitos>
- MANUAL DE CALÇADA ACESSÍVEL. Todos na calçada. Equipe Técnica de Planejamento Urbano. Prefeitura de Petrópolis: Rio de Janeiro, RJ, 98p., 2019. Disponível em: www.petropolis.rj.gov.br/pmp/phocadownload/destaques/2019/agosto/manual_de_calçada_acessivel_petropolis.pdf

ONGARATTO, C. A.; ROCHA, P. S. M. Uso de imagens na transformação do espaço urbano de União da Vitória - PR. In: OS DESAFIOS DA ESCOLA PÚBLICA PARANAENSE NA PERSPECTIVA DO PROFESSOR PDE. Governo do Paraná. Cadernos PDE; versão on-line; v. 1; 2013. ISBN 978-85-8015-076-6

RAMACCIOTTI, B. L.; CALGARO, G. A. Construção do conceito de minorias e o debate teórico no campo do Direito. **Sequência** (Florianópolis), v. 42, p. e72871, 2022.

RIBEIRO, G. S.; SILVA, K. A. da; SILVA, M. T. C. da; PINTO, T. de Farias. Cidade, cultura e acessibilidade: notas iniciais da relação entre cidades educadoras e direitos humanos. **Oikos: Família e Sociedade em Debate**, v. 31, n. 2, p.359-382, 2020. <http://dx.doi.org/10.31423/oikos.v31i2.9893>

RODRIGUES, G. A.; CHICONATO, D. A. Percepção da pessoa com deficiência física em relação a qualidade dos espaços pedonais. In: SIMPÓSIO DOS ENSINOS MÉDIO, TÉCNICO E TECNOLÓGICO: práticas docentes e criações discentes, 10^{o.}, 2023, São Paulo. **Anais [...]**. São Paulo: Centro Paula Souza, 2022. 10p. www.simpósio.cpsctec.com.br

RODRIGUES, G. A., FERRAREZI, L. A. & BOVÉRIO, M. A. Metodologia para determinação da abundância de árvores urbanas utilizando recursos de geotecnologias de acesso livre. **Journal of Biotechnology and Biodiversity**, v.8 n.3 (2020) 172-178. Acesso em 02 jul.2022. DOI: <https://DOI.ORG/10.20873>

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**, n.º 7, vol. 3 (3) 2005, pp. 121 - 132. ISSN: 1696-2095.

SASSAKI, Romeu. Inclusão no lazer e no turismo: em busca da qualidade de vida. São Paulo: Áurea, 2003.

SOUZA, N. C. de. **Análise da acessibilidade de escolas municipais e estaduais no município de Araruna-PR de acordo com a NBR 9050: 2020**. 2022. Trabalho de Conclusão de Curso. Universidade Tecnológica Federal do Paraná. Disponível em: <http://riut.utfpr.edu.br/jspui/bitstream/1/31280/1/analiseacessibilidadeescolasararuna.pdf>. Acesso em 4 jul. de 2023.

TEIXEIRA, B. C. C.; TAVARES, I. K.; MACHADO, G. R. Mobilidade urbana para pedestres: um estudo na Avenida Prefeito Olavo Gomes de Oliveira em Pouso Alegre – MG. In: 14.^a JORNADA CIENTÍFICA E TECNOLOGIA, 11.^o SIMPÓSIO DE PÓS-GRADUAÇÃO, IFSULDEMINAS, 13 DE DEZEMBRO DE 2022, v. 11, 4p. Campus Pouso Alegre: Pouso Alegre/MG, 2022. Disponível em: <https://josif.ifsuldeminas.edu.br/ojs/index.php/anais/article/view/524>. ISSN: 2319-0124

VALENTE, M. A mobilidade pedonal “mecanicamente apoiada”. **On the w@terfront**, vol. 12, april, p.101-118, 2009. Disponível em: <http://www.ub.edu/escult/Water/water12/Water012.pdf>. ISSN 1139-7365.

VASCONCELOS, L. R.; PAGLIUCA, L. M. F. Mapeamento da acessibilidade do portador de limitação 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>