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REVIEW

Accessibility and body supports: towards a more inclusive society

Accesibilidad y apoyos corporales: hacia una sociedad más inclusiva

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ABSTRACT

Introduction: throughout history, humanity has sought to transform its environment through architectural products and spaces, although for centuries it ignored the needs of people with disabilities. This panorama changed in the 1980s, when Ronald L. Mace introduced the concept of Universal Design, which proposed the creation of accessible environments for all. In Argentina, the enactment of Law No. 24.314 in 1994 marked a milestone by establishing accessibility as an essential condition for autonomy. However, INDEC studies in 2018 showed that more than 10 % of the population presented some difficulty, mainly motor, evidencing the urgency of inclusive policies.
Development: the Argentine State promoted urban, architectural and transportation plans to ensure inclusion, in addition to censuses and regulations that sized the problem. However, cities such as Córdoba reflected the persistence of architectural barriers: non-existent ramps, steep slopes and inadequate furniture. These limitations hindered mobility and social integration, affecting not only movement, but also access to education, health and employment. The research distinguished between impairment, disability and ambulatory capacity, highlighting the role of body support objects. Also, concepts such as ergonomics, biomechanics, anthropometry and comfort guided the design of devices that sought to improve the quality of life and safety of people with reduced mobility.
Conclusions: the analysis showed that inclusion did not depend solely on individual physical condition, but on the social and architectural barriers imposed by society. Overcoming these limitations required transforming collective awareness into concrete actions. The creation of adequate body supports and the enforcement of effective regulations were recognized as essential steps towards full inclusion.

Keywords: Universal Design; Accessibility; Disability; Architectural Barriers; Inclusion.

RESUMEN

Introducción: a lo largo de la historia, la humanidad buscó transformar su entorno mediante productos y espacios arquitectónicos, aunque durante siglos ignoró las necesidades de las personas con discapacidad. Este panorama cambió en la década de 1980, cuando Ronald L. Mace introdujo el concepto de Diseño Universal, que planteó la creación de entornos accesibles para todos. En Argentina, la sanción de la Ley N.º 24.314 en 1994 marcó un hito al establecer la accesibilidad como condición esencial para la autonomía. No obstante, estudios del INDEC en 2018 demostraron que más del 10 % de la población presentaba alguna dificultad, principalmente motora, evidenciando la urgencia de políticas inclusivas.
Desarrollo: el Estado argentino impulsó planes urbanos, arquitectónicos y de transporte para garantizar la inclusión, además de censos y normativas que dimensionaron la problemática. Sin embargo, ciudades como Córdoba reflejaron la persistencia de barreras arquitectónicas: rampas inexistentes, pendientes pronunciadas y mobiliarios inadecuados. Estas limitaciones dificultaron la movilidad y la integración social, afectando no solo el desplazamiento, sino también el acceso a la educación, la salud y el empleo. La investigación distinguió entre deficiencia, discapacidad y capacidad ambulatoria, destacando el rol de objetos de apoyo corporal.

Asimismo, conceptos como ergonomía, biomecánica, antropometría y confort orientaron el diseño de dispositivos que buscaron mejorar la calidad de vida y la seguridad de las personas con movilidad reducida. **Conclusiones:** el análisis demostró que la inclusión no dependía únicamente de la condición física individual, sino de las barreras sociales y arquitectónicas impuestas por la sociedad. Superar estas limitaciones exigió transformar la conciencia colectiva en acciones concretas. La creación de apoyos corporales adecuados y el cumplimiento de normativas efectivas fueron reconocidos como pasos esenciales hacia una inclusión plena.

Palabras clave: Diseño Universal; Accesibilidad; Discapacidad; Barreras Arquitectónicas; Inclusión.

INTRODUCTION

Throughout history, humanity has constantly sought to transform its environment by creating products, services, and architectural spaces that respond to social needs. However, for centuries, many of these advances were designed under parameters that excluded a significant sector of the population: people with disabilities. This reality began to be questioned more forcefully in the mid-1980s, when Ronald L. Mace coined the concept of Universal Design, defined as human activity aimed at conceiving and designing environments that are accessible to all people, regardless of their physical, cognitive, or sensory condition. Since then, inclusive design has taken on a fundamental role in the global agenda, promoting public policies, regulations, and practices that seek to guarantee equal opportunities in the use and enjoyment of spaces and products.

In the case of Argentina, the enactment of Law No. 24.314 in 1994 marked a milestone in the promotion of accessibility for people with reduced mobility. This regulation emphasized the importance of autonomy as an essential condition for daily life and full social development. Subsequently, the State has promoted accessibility plans in different areas—urban, architectural, and transportation—in addition to generating studies and censuses that allow for measuring the size of the population with disabilities. According to the National Institute of Statistics and Censuses (INDEC), in 2018, 10,2 % of the Argentine population over the age of six had some type of disability, with motor disabilities being the most prevalent. These data reflect the need to approach the design of environments and products from an inclusive perspective that is sensitive to diverse realities.[1]

However, despite regulatory advances and increased awareness, numerous physical barriers still persist in urban spaces, especially in cities such as Córdoba, where this work focuses its attention. Stairs without ramps, steep slopes, inadequate furniture, and difficult-to-access doors represent everyday obstacles that affect the mobility, independence, and social integration of those with physical limitations, whether temporary or permanent. These problems are exacerbated when considering that access to the urban environment is a basic right linked not only to movement, but also to health, education, employment, and participation in community life.

In this context, it is essential to reflect on concepts such as impairment, disability, architectural barriers, and ambulatory capacity, which allow for a clearer understanding of the situation of people with reduced mobility. This research aims to contribute to this field by addressing the need to create body support devices that improve mobility, comfort, and quality of life in urban environments.

DEVELOPMENT

Figure 1. Summary of Theoretical Framework

Throughout history, humanity has created and manufactured countless products and architectural environments to meet the needs of all people, which underwent constant changes according to necessity, and day by day, new ideas emerged from different designers, entrepreneurs, and others. However, there was a part of the human population that was not considered until, for the first time in 1985, Ronald L. Mace introduced the term Universal Design, in which he gave a closer look at the subject, which is defined as "that human activity that conceives, designs, and constructs the physical environment in such a way that no person, regardless of their condition, is excluded from its use and enjoyment". From that moment on, awareness of the issue of inclusion began to grow throughout the world, leading to the creation of laws and decrees to be complied with, both in the manufacture of products and in the creation of urban spaces.

In Argentina, on April 8, 1994, the Senate and Chamber of Deputies of the Argentine Nation passed Law No. 24,314, referring to accessibility for people with reduced mobility. This law establishes that:

It is the possibility for people to enjoy adequate autonomy as a fundamental condition for the development of daily life activities, without restrictions derived from the inadequacy of the physical environment for their social integration and equal opportunities.[2]

The Argentine government constantly seeks to promote the inclusion of all people by establishing laws, making plans for accessibility in urban, architectural, and transportation environments, conducting censuses that include questions for people with difficulties, and raising awareness among all people, which should aim at inclusive development in both urban spaces and products.

In 2018, INDEC conducted a study on the profile of people with disabilities and reported that 10,2 % of the population aged 6 and over in Argentina has some type of disability. Of this total, 48,8 % report having a motor disability. With reference to the Pampeana region. (Córdoba, Entre Ríos, Santa Fe, La Pampa, and part of Buenos Aires), motor difficulties predominate with 42,5 %.

Of the 10,2 % of the Argentine population, 61,1 % report having only lower motor difficulties (walking and climbing stairs), followed by 16,5 % who report difficulties in both the lower and upper limbs, and finally 12,4 % who report having only upper motor difficulties (grasping objects with their hands and arms).

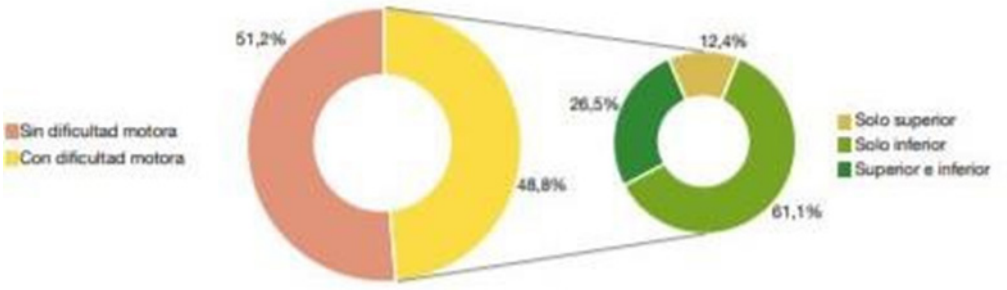

Figure 2. Population aged 6 and over, by type of motor difficulty

Among the 42,8 % of people with lower motor difficulties, 86 % have great difficulty climbing stairs or walking, and 14 % are completely unable to do so.[2]

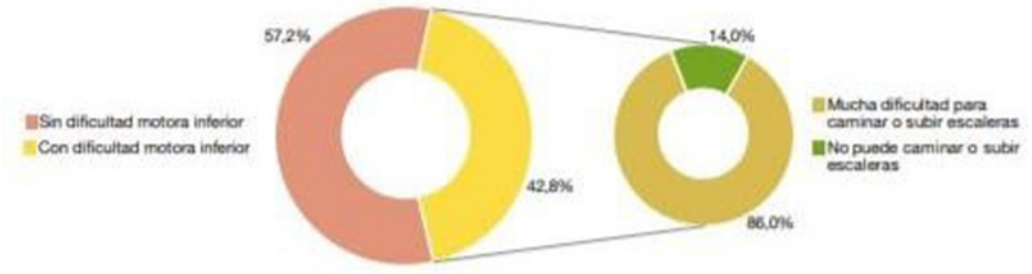

Figure 3. Population aged 6 and over with lower motor difficulties

Over the years and at present, it has not had an impact and been implemented in all areas, since in some sectors of cities, especially in the city of Córdoba, which is the focus of this project, there is urban furniture that presents certain physical barriers to access for people with physical disabilities, who, according to research, have even greater difficulty walking or overcoming obstacles.

In order to better understand and raise awareness of this issue, we consider it necessary to define concepts that affect people with certain difficulties, both physically and in the environment in which they live, i.e.,

certain physical barriers that limit their daily mobility.

According to the International Classification of Functioning, Disability, and Health (ICF), it distinguishes between the concepts of impairment and disability, referring to impairment as "any loss or abnormality of a psychological, physiological, or anatomical structure or function". In the case of physical disability, it is defined as: Physical disability can be defined as the result of a physical or visceral impairment that a person has which, when interacting with the environment, limits their motor performance. Visceral refers to deficiencies in the bodily functions and structures of the cardiovascular, hematological, immunological, respiratory, digestive, metabolic, endocrine, and genitourinary systems that limit the performance of tasks or actions in a normal context.[3]

With a better understanding of the two definitions mentioned above, we can now define people with ambulatory capacity, which is what we will be working on throughout the research. This is defined as:

Those persons with physical disabilities who are able to walk with the use of biomechanical aids (crutches, devices, canes, walkers, among others) to compensate for their mobility limitations. Within this group we find:

- Hemiplegics, with total or partial paralysis of one half of their body.
- Amputees, of one or both legs at various levels.
- People with temporary disabilities caused by heart or respiratory diseases.
- Pregnant women (from the fifth month onwards).
- Obese individuals.
- People with casts or compression bandages.
- People recovering from illness or surgery.
- Elderly people with physical disabilities.
- People affected by polio, spina bifida, sclerosis, cerebral palsy, and other types of diseases with sequelae or malformations, but who are able to walk.

A person with a permanent or temporary physical disability, whether from birth or acquired at some point in their life, faces a double challenge and a series of situations that a normal person does not. First, the person must accept what they are suffering and adapt to the situation positively with regard to their emotions, and then adapt to a new lifestyle that is different from that of others or from what they were used to.[1] This is a major process for anyone in this situation, and generally, not everyone has the standard of living to cope with their health, rehabilitation, employment, education, leisure, among other situations.[4]

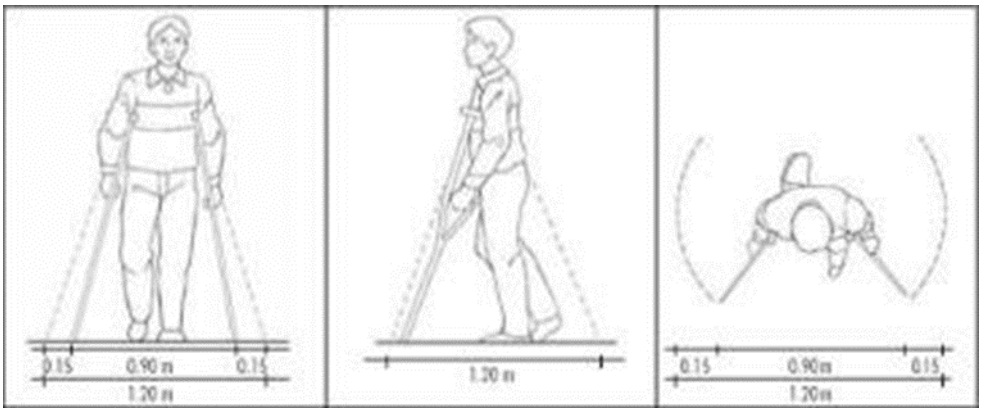

Figure 4. Person with crutch

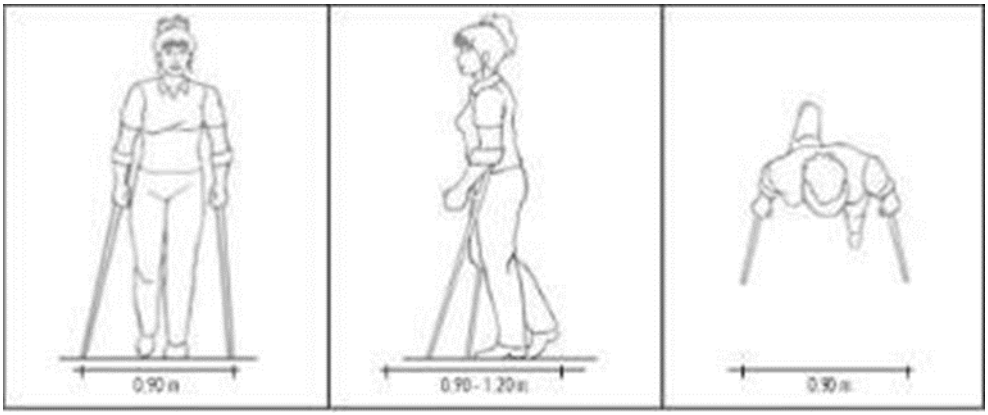

Figure 5. Person with canes (Canadian type)

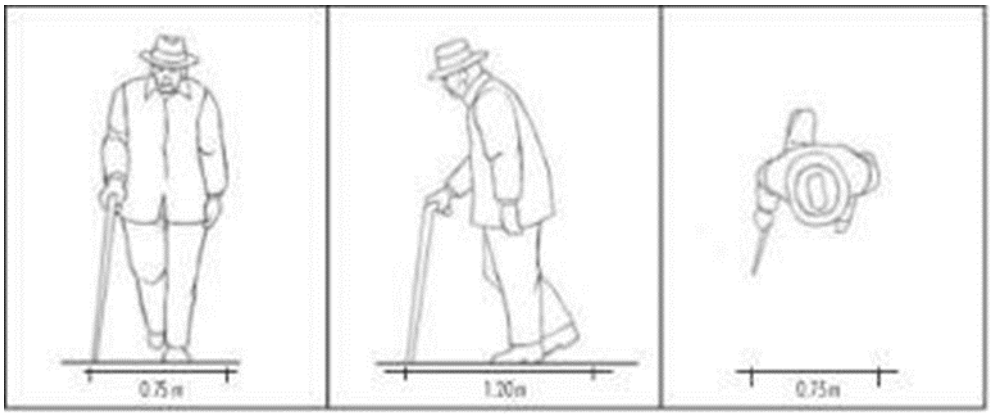

Figure 6. Person with a cane

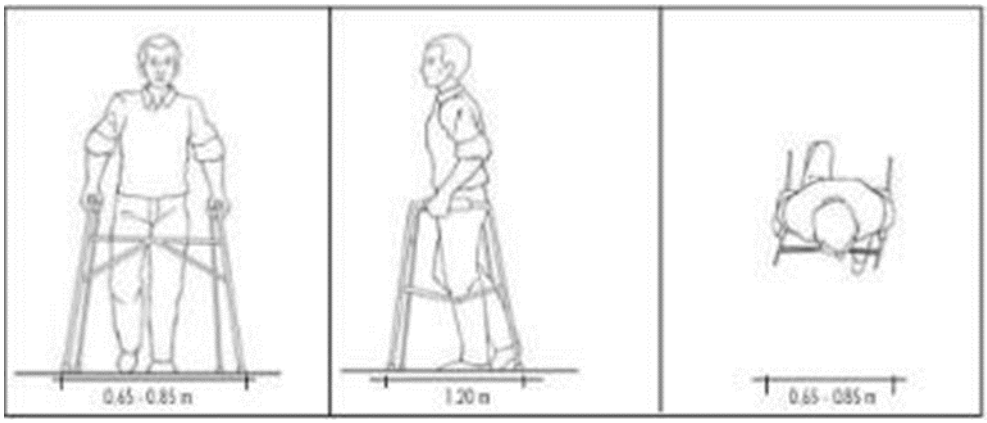

Figure 7. Person with a walker

In turn, getting around in urban environments depends on different types of physical support devices, depending on the person's specific needs. In the following figures, we can see these devices and highlight the anthropometric measurements of these people using the product, which are necessary for better mobility and maneuverability in the urban environment.

All human beings have at some point encountered some type of barrier that limited their ability to move, access certain power or jobs, and understand certain tools or systems. However, in addition to the problems that everyone must overcome, people with physical disabilities are the most affected by these barriers, which impact their ability to move around and integrate into society. In this regard, we are led to define what a barrier is, specifying it as:

Those derived from actions, whether due to negligence, ignorance, or omission on the part of society, which still has social barriers originating from the same causes. Physical or communication barriers are represented by all those obstacles, impediments, or hindrances that obstruct the free mobility, use, and communication of people, particularly in this case, people with reduced mobility and/or communication.[5]

These urban barriers have a negative impact on these people as they prevent their freedom of movement and require them to spend a lot of time planning their trips from one destination to another, as well as overcoming certain physical and inaccessible obstacles that arise when they are out and about, which causes them greater difficulties, such as the following:

- Difficulty and/or impossibility of overcoming uneven surfaces and stairs due to muscle and balance problems.
- Difficulty and/or impossibility of overcoming significant slopes.
- Difficulty passing through narrow spaces.
- Difficulty in traveling long distances without resting.
- Increased risk of falls due to tripping or slipping with their feet or canes, or tipping over in their wheelchair.
- Limited manual and visual reach.
- Difficulty opening or closing doors, especially if they have return mechanisms.
- Difficulty operating mechanisms that require both hands at the same time.

These difficulties cause people to prolong their rehabilitation and recovery time due to poor movements,

incorrect postures, and undue effort, among other things, which also has repercussions on their work, personal, and social lives.

In order to carry out the project in the best possible way and reduce the consequences for these individuals, the following definitions are considered to be of utmost importance when designing the body support device. These are:

- Ergonomics: "The science that studies people's work environment with the aim of improving their working conditions and the quality of the tasks they perform, by obtaining reliable data that allows changes to be recommended in specific situations".
- Biomechanics: This is a branch of bioengineering and biomedical engineering that describes and analyzes the movement of the human body. It is related to applied mechanics because it uses the principles of statics to analyze the magnitude and nature of the forces of the joints or muscles of the body. Kinematics analyzes particle motion, and dynamics determines the forces on bodies based on velocities and accelerations. Biomechanics provides information on the most effective movement patterns, equipment, and exercises recommended to improve human body movement. It also examines projects with patients who require prostheses due to amputations or muscle or joint injuries.
- Anthropometry: "Refers to the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue".
- Comfort: That which produces well-being and convenience. Any pleasant or unpleasant sensation felt by a human being prevents them from concentrating on what they have to do. The best overall sensation during activity is to feel nothing, indifference to the environment.

This research aims to help people who have difficulty performing certain movements to reduce their limitations, feel comfortable and safe, and prevent them from having difficulty functioning in their social and work environments and in their own mobility in the urban environment, thus creating a body support device that improves the person's movement and quality of life.

CONCLUSIONS

The historical, conceptual, and regulatory overview analyzed in this paper allows us to understand that accessibility and inclusive design are now fundamental pillars for guaranteeing equal opportunities and the full exercise of human rights. The concept of Universal Design, introduced by Ronald L. Mace in the 1980s, marked a turning point in the way physical environments and products are conceived. Based on this vision, it became clear that the exclusion of people with disabilities was not a consequence of their individual limitations, but rather of the way society structured its spaces, creating physical, social, and cultural barriers that restricted their participation.

In the case of Argentina, the enactment of Law No. 24,314 in 1994 and subsequent advances in public policy demonstrate the state's willingness to transform this reality. However, data provided by INDEC in 2018, which show that more than 10 % of the population has some type of disability—predominantly motor disabilities—indicate that enormous challenges remain. The situation in cities such as Córdoba highlights the gap between the legal framework and everyday reality: non-existent ramps, inadequate street furniture, and inaccessible stairs are clear examples of obstacles that limit autonomy and social integration.

The research also allowed for a deeper understanding of concepts such as impairment, disability, ambulatory capacity, and architectural barriers, providing a theoretical framework that is essential for the design of body support devices. These devices not only serve a practical function, but also represent tools that dignify people by allowing them to carry out their daily activities with greater safety, comfort, and autonomy. The analysis of ergonomics, biomechanics, anthropometry, and comfort shows that sensitive and responsible design can make the difference between exclusion and active participation.

It is important to note that physical barriers have an impact beyond mobility, as they directly affect access to health, education, employment, and community life. This means that accessibility should not be thought of solely in terms of architecture or transportation, but as a cross-cutting condition for building more just and equitable societies.

In conclusion, the main challenge is to transform social and political awareness into concrete actions that eliminate the barriers that still exist. The creation of adequate physical support devices, together with the implementation of effective regulations and citizen commitment, are fundamental steps towards real inclusion. Only in this way will it be possible to ensure that all people, regardless of their physical condition, can fully inhabit and enjoy urban space and community life.

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None.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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