



Accessibility for passengers with hidden disabilities in air transport: A literature review

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ABSTRACT

This article analyzes the existing literature on the needs of passengers in transport and tourism situations that are hidden or invisible to service providers. Although accessibility in air transport is an emerging field of research, this study adds to the literature an in-depth understanding of the barriers these air passengers face, investigating accessibility recommendations for people with hidden disabilities in transport situations, including air transport. Various contexts of transport and tourism involving buses, subways, or train challenge this population through spatial disorientation, communication difficulties, sensory stimulating environments, anxiety, and other behaviors. These needs gain notoriety in airports due to the complexity of the environment and air travel, especially for individuals with intellectual, neurological, or developmental disabilities. As a result, the most emphasized recommendations in the literature were categorized according to the passenger's assistance needs in air travel, providing opportunities for improving assistance processes, structural conditions, and services at airports.

1. Introduction

Accessibility is generally associated with the difficulty of reaching or accessing a particular location based on destination, time, cost, or available transportation alternatives [GRIMME et al., 2010]. However, the sense of accessibility addressed in this study refers to the process of accommodating the needs and preferences of any user, concerning people with disabilities, in any place, item, or service, whether physical or virtual, with autonomy and ease of interaction, comprehension, or use [UN. United Nations 2015].

Among the wide range of disability types addressed in accessibility issues, hidden disabilities stand out. Hidden or invisible disabilities encompass non-apparent characteristics such as conditions associated with mental health, autoimmune and neurological conditions, or chronic pain [CDC. Centers for Disease Control and Prevention 2023]. Hidden disabilities also include developmental disabilities that affect a range of cognitive processes and are considered hidden because they do not have a physical presentation that aids in their identification [COUZENS et al., 2015], such as autism spectrum disorder (ASD), intellectual disability, multiple sclerosis, lupus, autism, epilepsy, fibromyalgia, arthritis, attention deficit hyperactivity disorder (ADHD), deafness or hearing difficulties [CDC. Centers for Disease Control and Prevention 2019].

As mentioned, chronic health conditions causing pain are also considered hidden disabilities. For example, rheumatoid arthritis, which, besides affecting the individual's physiological condition, also influences the patient's psychological stress and sensory processing dysfunction [PROVENZA et al., 2004]. Chronic pains, such as fibromyalgia, impact muscle strength in the upper and lower limbs, and the fatigue caused by this condition contributes to psychological patterns like anxiety and depression [BERBER et al., 2005, BRANDT et al., 2011].

Several hidden conditions have common characteristics such as communication limitations; cognitive limitations or learning difficulties; sensitivity to sensory stimuli; difficulties in social interaction; anxiety or restlessness; depression; attention deficit or concentration difficulties; restricted and repetitive behaviors or interests; irritability or sudden behavioral changes; and mobility and balance limitations [CDC. Centers for Disease Control and Prevention 2024]. Despite definitions grounded in the literature, the characteristics involving hidden disabilities are evolving or under discussion as each condition has an inherent complexity that can vary widely in severity and impact on an individual's life. Thus, accessibility conditions can be adapted to the specific needs of particular groups but not others [MCKERCHER and DARCY, 2018].

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Passengers with hidden disabilities at an airport are prone to sensory overstimulation, making social interaction, environmental comprehension, and staying in the location for long waiting periods challenging. These individuals may have specific demands or hidden needs, mainly related to psychosocial and cognitive factors. Spatial disorientation, for example, results in frustration, anxiety, and confusion for people with cognitive disabilities [BOSCH and GHARAVEIS, 2017]. Additionally, anxiety and stress are the primary health factors leading to behaviors that require intervention from airport service teams [SHAPIRO, 1976, MCINTOSH et al., 1998, BOGICEVIC et al., 2016]. Data from a survey at a European regional airport handling approximately 75 million passengers annually showed that 10% of passengers experienced feelings of confusion and anxiety, especially at airport entrances, security checkpoints, boarding areas, restaurants, and shops [CECCATO and MASCI, 2017].

A study conducted in the United Kingdom found that 65% of passengers reported at least one personal circumstance (permanent or temporary) that could negatively impact their airport experience or require assistance. Among the identified circumstances, 49% were related to psychological factors, 36% to cognitive factors, and 13% to sensory factors. The most highlighted issues were anxiety, stress, depression, autism, ADHD, dyslexia, visual impairment, and memory, hearing, or balance problems [CAA. Civil Aviation Authority 2021]. Another survey on the experiences of passengers with disabilities in air transport with 3,510 respondents, including 715 with some form of disability, found that just over three-fifths had access difficulties, with at least 52% having a hidden or non-physical disability [CAA. Civil Aviation Authority 2023].

The provision of assistance in practice is directed at meeting explicit or identifiable demands of passengers, generally hours before check-in or upon presenting for boarding at the airport. However, a hidden disability may not always be perceptible to an operator or declared by the passenger, complicating assistance or understanding passenger behavior in critical situations.

In this sense, significant scientific contributions address airport accessibility for people with hidden disabilities, generally focusing on ASD [SKILLICORN, 2013, DEMPSEY et al., 2021, CHISCANO, 2021, PETERSON et al., 2022]. There are also studies with recommendations for airports for passengers with intellectual or cognitive disabilities [EDWARDS et al., 2016, TURNER, 2022] or specific needs of passengers at airports [MARTÍN-DOMINGO et al., 2024]. However, there is a need for an in-depth analysis of the barriers faced in other modes of transport besides air, addressed from different theoretical perspectives [MARTÍN-DOMINGO et al., 2024].

Thus, seeking new groupings in the literature on accessibility for passengers with hidden disabilities at airports, this investigation aims to find recommendations in transport situations, including airports or air transport, that also contribute to relevant accessibility aspects. The most common practices implemented in transport situations that can offer appropriate accessibility recommendations to the reality of airports will be selected and categorized according to the main stages of an air journey.

2. Methodology

The process of systematic literature review was conducted according to the study by Boell and Cecez-Kecmanovic [BOELL and CECEZ-KECMANOVIC, 2014], which guides the hermeneutic, interactive, and cyclical stages of understanding individual texts to extract meanings that will form part of the current state of knowledge in a particular area. The review began with a search in scientific databases: Scopus, Web of Science, ScienceDirect, Taylor Francis, Sage Journals, and Springer. The first stage of the review was to develop a set of keywords to find the desired publications. Part of the search term set comprised accessibility, people with disabilities, transport, and tourism. The other part consisted of keywords to filter the search for studies addressing accessibility for passengers with hidden disabilities using consolidated scientific terms associated with intellectual, neurological, and developmental disabilities.

The search filters were limited to title, abstract, and keywords without restricting the language or publication date. In most databases, the filters were limited to the abstract. After returning a broad set of studies (n=359), duplicates were excluded, and a critical reading was conducted based on the following inclusion criteria: accessibility recommendations for passengers with hidden intellectual, neurological, or developmental disabilities in transport and tourism situations. Figure 1 displays the systematic literature review process conducted in this study.

After reading the abstracts and specific parts of the studies, 94 articles were identified in the principal set adherent to the review's objective. Then, a complete reading of this set of studies was conducted, and bibliographic mapping was performed, investigating other research through the reference lists using the snowballing method [WOHLIN, 2014], which added 12 more studies, totaling 109 papers. A thorough reading and analysis of this set were then developed again according to the inclusion criteria, systematizing accessibility recommendations that can be adapted to airport environments and air travel. Thirty-seven studies were chosen and detailed in Table 1.

3. Results and Discussion

Regarding the relevance of the studies, no filter restricting the quality of publications at the citation level was applied, considering the metrics presented by the Scopus portal. Therefore, this study considered democratizing the inclusion of any publication using the literature review method. On the other hand, most selected publications are indexed in journals with relevant impact factors in the academic or scientific field, considering the bibliometric parameters of the same portal.

Analyzing specific characteristics of the selected documents provides a comprehensive view of the distribution and concentration of different aspects of studies on transport, tourism, and accessibility. The graph in Figure 2 shows the concentration of publications by year, revealing a more significant proportionate trend for the topic from 2019, with a significant increase in the number of publications, especially in 2021 and 2023. This increase may reflect greater visibility of the needs of

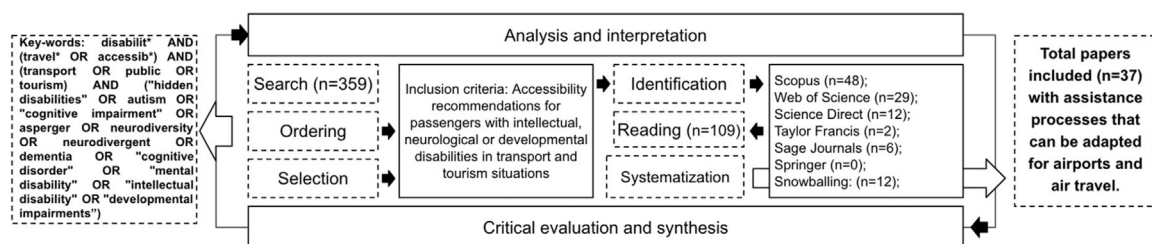


Figure 1. Systematic literature review.

Table 1
Method and Participants Researched.

ID	Study	Methods									Study participants and Sampling	Transport Context		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(1)	(2)	(3)
1	Hunter e Hron [HUNTER and HRON, 1999a, HUNTER and HRON, 1999b];	x		x							Sensory and cognitive disability. (*)		x	
2	Blackman et al. [BLACKMAN et al., 2003];		x								Cognitive disability: elderly people. (*)			x
3	O'Neill e O'Mahony [O'NEILL and O'MAHONY, 2005]			x							47 people with disabilities: 16 had visual impairments; 25 used wheelchairs; 3 had learning difficulties; 3 had walking difficulties.		x	
4	Gabriels e Hill [CAA. Civil Aviation Authority 2010];		x								ASD. (*)			x
5	Darcy [DARCY, 2012];	x			x						2600 experiences and 19 interviews of people with disabilities, including hidden disabilities and conditions related to fatigue requiring oxygen.	x		
6	Lindqvist e Lundalv [LINDQVIST and LUNDÄLV, 2012];	x									21 people: 6 with neuropsychiatric conditions (stroke, aphasia, ADHD, and Asperger's syndrome), 7 with hearing impairment, and 2 with visual impairment.		x	
7	Amet [AMET, 2013];			x							150 families of people with ASD and 50 families of people with Down syndrome.			x
8	Hamed [HAMED, 2013];			x							ASD. (*)			x
9	Skillicorn [SKILLICORN, 2013];		x								ASD. (*)	x		
10	Ruddy et al. [RUDDY et al., 2015];			x							20 children with ASD, 14 boys and 6 girls.	x		
11	Deka, Feeley e Lubin [DEKA et al., 2016]			x							703 respondents: adults with ASD, but mostly filled out by parents, counselors, legal guardians, and others.	x		
12	Destin et al. [DESTIN et al., 2016];					x					5 focus groups: 15 individuals with visual impairment and 12 with intellectual disability.		x	
13	O'Reilly et al. [O'REILLY et al., 2016];	x	x			x					51 companions, 7 people with intellectual disabilities, 21 flight attendants, and 13 security agents.	x		
14	Bosch e Gharaveis [BOSCH and GHARAVEIS, 2017];		x								Cognitive and visual impairment. (*)		x	
15	Neo e Flaherty [NEO and FLAHERTY, 2018];		x								ASD. (*)	x		
16	Bigby et al. [BIGBY et al., 2019];	x									Cognitive and sensory disability: ASD, cerebral palsy, intellectual disability, acquired brain injury, deafness, and deafblindness. 21 people were selected: 12 individually and two focus groups with 9 members.			x
17	Freund et al. [FREUND et al., 2019];		x								117 online questionnaires for parents of people with ASD.			x
18	Biglieri [BIGLIERI, 2020];	x									Intellectual disability: Alzheimer's. 8 people.			x
19	McCausland et al. [MCCAUSLAND et al., 2020];	x									Just over 700 participants: 25.6% have intellectual disabilities, the rest with companions, caregivers, or family members.		x	
20	Mathews, Marshall e Wilkinson [MATHEWS et al., 2020];						x				Cognitive disability. (*)			x
21	Pfeiffer, Sell e Bevans [PFEIFFER and SELL, 2020];					x	x				69 men and 18 women with ASD, average age of 23 years.		x	
22	Van Horn et al. [VAN HORN et al., 2020];		x			x	x				Various groups of passengers with disabilities, including cognitive disabilities and ASD.	x		
23	Van Holstein, Wiesel e Legacy [VAN HOLSTEIN et al., 2022];	x									16 professionals from departments working with public transport and advocacy for the rights of people with intellectual disabilities.		x	
24	Chiscano [CHISCANO, 2021];					x		x			25 people with ASD.	x		

(continued on next page)

Table 1 (continued)

ID	Study	Methods									Study participants and Sampling	Transport Context		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(1)	(2)	(3)
25	Dempsey et al. [DEMPSEY et al., 2021];	x									97 parents of young people with ASD.	x		
26	Lim et al. [LIM et al., 2021];			x	x						25 parents of people with ASD.		x	
27	McDonnell et al. [MCDONNELL et al., 2021];					x	x				10 adults with ASD, aged 21 and older.		x	
28	Yeung [YEUNG, 2021];						x		x		ASD. (*)	x		
29	Peterson et al. [PETERSON et al., 2022];				x						224 participants: 176 companions and 48 people with intellectual disabilities.	x		
30	Turner [TURNER, 2022];	x									10 people with intellectual disabilities and 10 companions.	x		
31	Wood [WOOD, 2022];		x		x				x		General disabilities, including individuals with dementia or Alzheimer's. (*)	x		
32	Garzon [GARZON, 2023];		x							x	People with Aphasia (communication difficulties). (*)	x		
33	Neven e Ectors [NEVEN and ECTORS, 2023];	x				x	x				Physical, visual, intellectual disabilities, and ASD. 45 individuals were selected.		x	
34	Small et al. [SMALL et al., 2023];	x	x								21 participants with visual impairment.	x		
35	Zhao et al. [ZHAO et al., 2023];	x									28 caregivers of people with ASD.			x
36	Martín-Domingo et al. [MARTÍN-DOMINGO et al., 2024];		x								All types of disabilities, including sensory, hidden, and learning disabilities. (*)			x
37	Tata et al. [TATA et al., 2024a];				x			x			203 statements from passengers with hidden disabilities on a tourism portal.	x		

Source: The authors. **Legend:** (1) Interviews; (2) Literature Review or bibliographic research; (3) Questionnaire or Survey; (4) Online Research; (5) Focus Groups; (6) Field Research or analysis of individual experiences in real situations; (7) Ethnography; (8) Document Analysis; and (9) Case Study. (*) Sampling information not specified. (1) Airports and Air Travel are the most cited, followed by (2) Public Transport, including buses, trains, and subways, and then contexts of (3) Tourism.

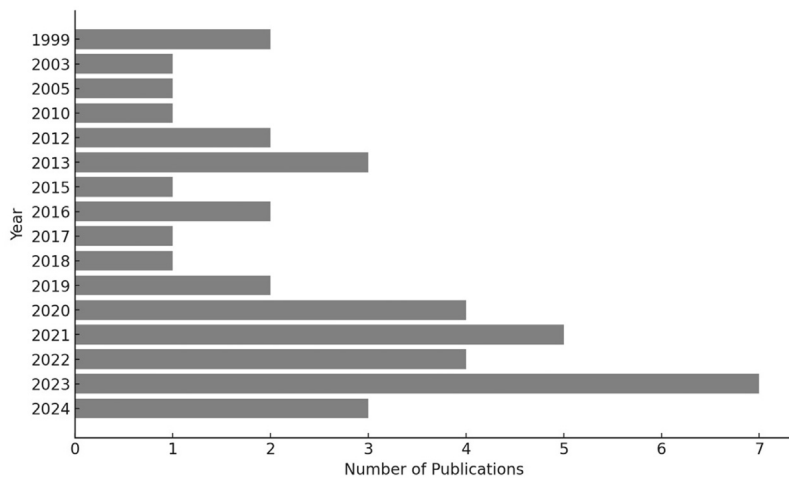


Figure 2. Concentration of publications by year.

people with hidden disabilities and an academic and institutional focus on improving transport infrastructure and services for everyone.

The graph in Figure 3 shows the distribution of the nine types of research found in the methodologies of the selected studies: (1) Interviews; (2) Literature Review or bibliographic research; (3) Questionnaire or Survey; (4) Online Research; (5) Focus Groups; (6) Field Research or analysis of individual experiences in real situations; (7) Ethnography; (8) Document Analysis; and (9) Case Study.

Interviews and literature reviews predominated with 14 and 11 publications, respectively. This information suggests that qualitative methods providing detailed and contextual insights are preferred. Other methods, such as surveys and online research, are also standard but to a lesser extent. This pattern may emphasize understanding individual experiences and perceptions in detail; many studies are accompanied by data or information searches on specific websites.

The graph in Figure 4 groups the types or contexts of transport of the selected studies, with (1) Airports and Air Travel being the most cited,

followed by (2) Public Transport, including buses, trains, and subways, and then contexts of (3) Tourism, which also includes subcategories linked to public transport, air transport, as well as travel agency services, hospitality, and others. These groupings highlight the diversity and complexity of contexts addressed by researchers, indicating concerns with accessibility in different transport systems and tourism environments.

Table 1 presents the 37 selected studies, the methods enumerated, specific information about study participants and sampling conducted in the research, and the types of transport contexts analyzed.

Considering the objectives of the selected studies, comprehensive approaches to accessibility in transportation are revealed, focusing primarily on preparing and adapting travel environments for people with disabilities and raising societal awareness. The studies range from investigating the physical, social, attitudinal, and communication barriers that limit the access of people with disabilities to public transportation to analyzing specific assistance programs in airports. There is a predominance of research exploring the experiences and challenges faced by

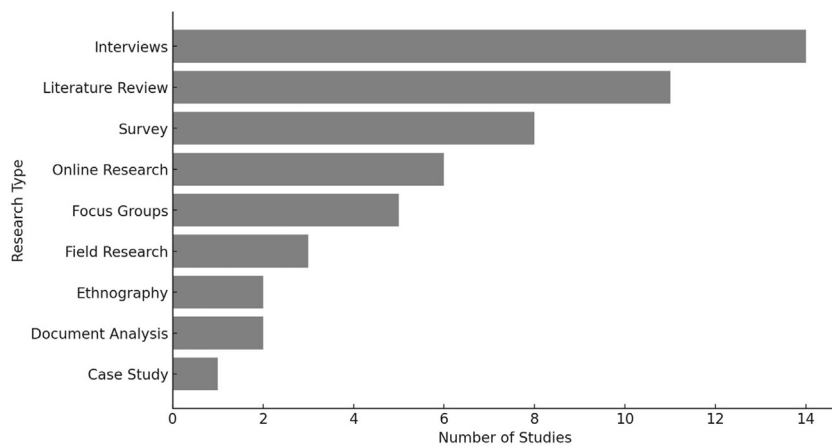


Figure 3. Concentration of identified research types.

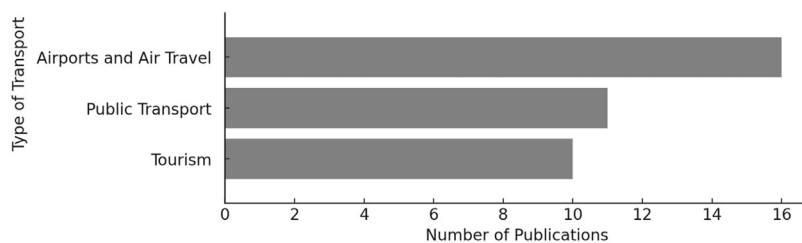


Figure 4. Concentration of identified transport contexts.

people with ASD, their families, and caregivers. This is notable because ASD represents a significant portion of hidden disabilities.

Much research also analyzes other groups with intellectual, cognitive, sensory, and learning disabilities. This mapped diversity is essential because the literature on the inclusion of people with disabilities in transportation and tourism contexts gives more attention to those with mobility issues and less to those with intellectual disabilities [GILLOVIC et al., 2021]. Other mapped objectives mainly focus on the following themes: experiences of travel agencies; strategies for orienting elderly passengers; physically and sensory comfortable environments; tourism and hospitality accommodations; facilities at public and air transportation stations; communication and language barriers in using transportation services; service providers' training programs; and regulatory practices.

In the synthesis of the studies presented in Table 1, in the column 'study participants and sampling,' some publications did not detail how the process of selecting the researched individuals was conducted, including the methods of sampling individuals and describing their characteristics such as gender, age group, and other information. Additionally, many studies based their information primarily on online surveys, which, despite presenting descriptions of passengers' actual experiences, do not provide a robust scientific foundation like other evidenced research that conducted systematic literature reviews in scientific databases [MARTÍN-DOMINGO et al., 2024, VAN HORN et al., 2020].

In the following sections, the analysis of the studies and their common points are grouped into categories related to passenger assistance procedures in air travel and the use of the airport environment.

3.1. Planning the Trip in Advance

Many authors highlight the importance of passengers investigating the accessibility of transport locations in advance [SKILLICORN, 2013, DEMPSEY et al., 2021, CHISCANO, 2021, CAA. Civil Aviation Authority 2010, RUDDY et al., 2015, NEO and FLAHERTY, 2018, VAN HORN et al., 2020, LIM et al., 2021]. This planning can be mediated by companions, such as family members, accessing online information on the

official websites of airlines, travel companies, or blogs sharing passenger stories. Many use mobile apps that allow real-time route updates and transport arrival times [LIM et al., 2021, ALI et al., 2022]. This anticipation of travel information prevents delays and reduces time spent on service procedures, reservation information gathering, and interpersonal communication [BIGBY et al., 2019, CHISCANO, 2021].

However, there is a concern about the clarity of this online information [PETERSON et al., 2022]. In air travel, passengers often suggest itineraries with simple language and visual formats that include stories in text and video [CHISCANO, 2021, VAN HORN et al., 2020]. Another important measure, besides videos of the air travel process, is the provision of illustrative guides for familiarization with the environment (social stories) [SKILLICORN, 2013, CAA. Civil Aviation Authority 2010, POYADE et al., 2017, MILLER and ZARCONE, 1968, SOCCINI et al., 2020]. These materials can be helpful, for example, in helping users find the correct boarding platform, increasing passengers' confidence, who will be less likely to seek assistance or become stressed due to the increased distance to be traveled in the terminal [BIGBY et al., 2019].

In an airport environment, delays, cancellations, and other factors beyond the passengers' control are common, posing a challenge for those with hidden disabilities who, even with advanced travel planning, may become anxious or stressed at the airport [CHISCANO, 2021, ZHAO et al., 2023]. Therefore, while it is positive that airports and airlines provide informative materials such as booklets or videos of the travel process using images and explanations, this type of content only partially assists passengers because, as Van Holstein, Wiesel, and Legacy [VAN HOLSTEIN et al., 2022] explain, the primary needs of these individuals occur in-person during the journey.

Procedures outside the traveler's control that result in stress can have their impact minimized through prior communication between airlines and people with disabilities. This is important because many passengers dislike unexpected changes in routine and require predictability in their daily actions [SKILLICORN, 2013], making the experience more friendly for these passengers [HAMED, 2013]. One of the most emphasized measures in studies analyzing airports and air travel is priority access at check-in, security control, and boarding. This is important because airports have noisy spaces, long lines, and unfamiliar environmen-

tal contexts that can cause anxiety in individuals with hidden disabilities [CHISCANO, 2021, ZHAO et al., 2023, TATA et al., 2024a].

Dempsey et al. [DEMPSEY et al., 2021] recommend that airlines have a representative to guide these passengers before the flight (possibly online) about schedules, specific accommodations, bathroom accessibility, sitting in a small space and using a seatbelt for long periods during the flight, facing contact with crowds; security verification procedures; disembarking and baggage collection; and evaluating the limited food options during the flight. Other raised orientations involve the possibility of airport visits to plan how to reduce waiting periods in lines [RUDDY et al., 2015].

Another recommendation by Gabriels and Hill [CAA. Civil Aviation Authority 2010] advises those who have never flown to visit the airport days before the trip and request authorization from service providers to show the routines performed in the security area. Additionally, they recommend booking the seat on the aircraft in advance and paying attention to the distance to the bathrooms, which can be disturbing due to the sounds of flushing and the constant movement of other passengers. Finally, considering seat booking, it is advisable to choose isolated seats to avoid context agitation, such as children kicking the seat in front [CAA. Civil Aviation Authority 2010].

Regarding advance visits, some airports, in partnership with airlines, conduct visit programs. However, this is not always possible in restricted areas due to strict security regulations. It is rare to find airports that offer a complete travel cycle experience that includes access to the security sector and boarding the plane [HAMED, 2013]. These initiatives are positive and involve the commitment of multidisciplinary teams in partnership with airlines to simulate travel experiences from check-in, security sector, boarding, "flight with the aircraft on the ground" for a few minutes, and baggage collection [SKILLICORN, 2013]. The great advantage of these experiences is training operators to understand passenger behaviors or doubts.

Another initiative to help with travel planning is the availability of technological tools to teach users the typical stages of a journey in a didactic and intuitive manner. For example, technological tools using smartphones are already offered, showing how to use public transportation and interact with people in public places [VAN HOLSTEIN et al., 2022, MCDONNELL et al., 2021] or how to gain confidence to travel independently [HUNTER and HRON, 1999b, MCCAUSLAND et al., 2020, NEVEN and ECTORS, 2023], encouraging individuals to learn typical situations like reaching the bus stop, boarding, pulling the stop indicator, and crossing the street [PFEIFFER and SELL, 2020]. Currently, apps propose teaching users air travel through didactic or easily understandable figures, comics, and videos.

Providing information to passengers before the travel cycle is essential, but more is needed. It is also necessary to prepare the airport context to receive these passengers since the main reasons generating inconvenient situations occur in the airport environment are the accumulation of sensory stimuli and unpredictabilities, usually referring to unfamiliarity with the environment, standard procedures, and unfamiliar people.

3.2. Accessibility During the Journey

Airports are sensory stimulating environments: noisy or loud, crowded with people, lines, and unreliable schedules [RUDDY et al., 2015, TATA et al., 2024a]. Waiting, noise, and lighting are the primary sources of stress for individuals with sensory processing dysfunction, also called neurodivergent. These passengers have needs in tourism trips due to limitations in social interaction, fear of crowds, and strict routine needs, leading to anxiety and emotional crises, sometimes mitigated with sleeping medications [SEDGLEY et al., 2017]. The combination of these factors causes, in addition to anxiety, depression, and social isolation [NEO and FLAHERTY, 2018]. In airports, this feeling arises

mainly due to communication, navigation, and security procedure barriers [EDWARDS et al., 2016, TURNER, 2022, O'REILLY et al., 2016].

Some studies indicate that some hotels have signage and implementation of quiet zones from a visual and auditory perspective [FREUND et al., 2019, SMALL et al., 2023]. Additionally, concerning accessibility, less stressful environments are recommended in busy areas, reducing traffic volume and providing safe rest areas [DEKA et al., 2016]. These types of environments can be interesting in public areas of some airports, given the difficulty of social interaction for these individuals. However, the distance of this area concerning the boarding gate must be considered to avoid long distances and the proximity of essential places like assistance points and bathrooms. Providing quiet and crowd-free spaces for airport management is complex as airport areas are usually limited and dedicated only to essential processes and commercial or retail establishments. However, these areas promote positive perceptions of comfort and safety to passengers [CECCATO and MASCI, 2017].

In bus stations, noises are considered highly disturbing for those with cognitive disabilities [DESTIN et al., 2016], causing anxiety, claustrophobia, and psychological exhaustion when traveling [LINDQVIST and LUNDÄLV, 2012]. In airports, stimuli are mainly generated by loud-speaker announcements, people talking [ZHAO et al., 2023], light panels, sounds during security inspections, engine noise, and aircraft ventilation systems [SKILLICORN, 2013]. These passengers dislike people moving, delays causing waits, contact with strangers, and the tight or confined environment inside the aircraft [SKILLICORN, 2013].

Due to these factors, many authors stress that public transport waiting processes generally occur with fewer crowds and, consequently, less noise [LIM et al., 2021]. These measures aim to prevent situations where security personnel must act strictly due to passengers' violations of procedures exhibiting signs of aggressiveness or evasive behavior [SKILLICORN, 2013].

The security check or control sector is the most challenging space in the airport for those with hidden disabilities [VAN HORN et al., 2020]. Research recommends that agents in this sector be flexible regarding removing personal items, such as electronic devices, during the scanning equipment passage [CHISCANO, 2021]. Hamed [HAMED, 2013] cites that some travel agencies guide disabled tourists through this sector wearing loose and comfortable clothes, not carrying coins in their pockets, or belts with metal buckles. Other tips include using sunglasses or headphones to avoid sensory stimuli [HAMED, 2013].

Some inspection actions can be embarrassing for many people as agents act according to strict rules and are generally not flexible to passengers' needs. Even though there are operations proposing the flexibility of procedures in assisting people with disabilities, there is still a need for security agents' training [PETERSON et al., 2022]. Thus, it is necessary to develop procedures and regulations that disseminate knowledge and guide operators' skill development actions, which will be the topic of the next section.

3.3. Operators' and Agents' Competencies

Passengers' physical, sensory, or communicative needs should not be restricted to the built environment design in airport terminals but to the customer service team's attitudes and air travel regulatory regimes [BUDD and ISON, 2020]. The quality of services provided to this population in social environments, including transport, still depends on specialized people such as social workers and other care providers [MARSACK-TOPOLEWSKI and WEISZ, 2020]. Generally, these passengers do not have an appearance that distinguishes them from others. Moreover, their behaviors can vary due to the diversity of types of disabilities, limitations, or needs that exist; some need much help, others less, requiring the service teams' assistance provision competencies, especially in identifying these passengers and their demands.

Freund et al. [FREUND et al., 2019] describe that many families feel socially excluded during trips due to strangers' strange looks directed at their children with ASD exhibiting atypical behaviors. Therefore, these people, including passengers with intellectual disabilities [MCCAUSLAND et al., 2020], lack the understanding of the reception or service team [FREUND et al., 2019]. This need for proximity to the service teams is pertinent because these individuals have difficulty facing situations involving crowds and the manifestation of peculiar sensations such as intense fear of being separated from family members [DEMPSEY et al., 2021, PETERSON et al., 2022, TATA et al., 2024a].

Many of the attitudes considered harmful, such as pointing, whispering, and other reactions, refer to the lack of understanding or ignorance about behaviors or ways of acting of people with hidden disabilities. Skillicorn [SKILLICORN, 2013] highlights that situations involving long, crowded lines generate these negative attitudes the most. For example, airport employees may not understand what is happening by looking only at the individual's physical appearance, exhibiting peculiar behaviors such as agitation, shouting (echolalia), strong tugs on clothing, or crying fits. These behaviors may be incomprehensible to most people, considering these attitudes inappropriate in public.

Therefore, training actions for airport and airline operators to provide an active and genuine interaction with these passengers is essential [CHISCANO, 2021, NEVEN and ECTORS, 2023]. For example, they suggest awareness campaigns to inform the public about invisible needs and how to react to specific behaviors [TURNER, 2022, LIM et al., 2021]. Alternatively, improvements should be proposed in service provision to identify passengers who are uncomfortable or anxious and offer additional help with dignity and respect [HUNTER and HRON, 1999b, VAN HOLSTEIN et al., 2022,51].

There is already this concern in hospitality services, where tourist reception teams conduct training on the demands of people with sensory disabilities [FREUND et al., 2019]. Families with ASD are less likely to access public places such as restaurants, cafes, hotels, and cinemas, mainly due to the lack of professional assistance to help them with challenging behaviors [AMET, 2013]. It is necessary to encourage empathy from others to help the public understand the behavior of those with hidden disabilities and provide special assistance to help these passengers find a quiet and crowd-free place [HAMED, 2013]. This assistance should also extend to the context within the aircraft, where flight attendants can offer special assistance, especially during the use of the aircraft's bathrooms [ZHAO et al., 2023].

However, care and attention are needed as some service approaches may work very well with an older person with cognitive or intellectual disabilities. However, they may be inappropriate when used with a person with intellectual disabilities or someone with ASD. Skillicorn [SKILLICORN, 2013] highlights that in the context of an air journey, in an incomprehensible situation for the passenger, a typical service provider reaction is to use a calm tone of voice and minimize the physical distance from the individual needing assistance.

This approach with individuals with communication or language difficulties [GARZON, 2023] or ASD may not be appropriate because many have limitations in language reception skills and sensory processing of the environment and thus may exhibit a non-compliant behavior reaction, which can be frustrating for both involved [SKILLICORN, 2013]. Therefore, complementing the studies, the service provision method depends on developing competencies suitable to the type of disability and the context where assistance is pertinent. Given nuances and specificities, this action should involve discussions and training with the support of groups and associations that support people with disabilities [TURNER, 2022, HUNTER and HRON, 1999a].

Many airports have large built areas with long distances and significant passenger volume, facilitating spatial disorientation, loss of focus, and other disorders for inexperienced people or those with limitations. "Spatial disorientation" is a term significantly cited in the selected studies. Therefore, many passengers demand an intense proximity of inter-

personal relationships with agents and service providers. As evidenced in this section, developing competencies for airport service operators is relevant, as is preparing a person with hidden disabilities for the trip. However, it is also pertinent that the structural elements of the environment are suitable to guide and alleviate user frustrations.

3.4. Usability of Facilities

Travelers' decision criteria to participate in tourist activities are influenced by the degree of accommodation accessibility [FREUND et al., 2019]. Recommendations related to improving structural accessibility or architectural aspects in public places were found in the literature addressing three primary contexts: bathrooms, sensory rooms, and signage for location and spatial orientation.

Bathrooms demand attention because people with hidden disabilities face some challenges in these places, for example, the need for sufficient bathrooms [ZHAO et al., 2023]. Perry and Kozub [PERRY and KOZUB, 2011] discuss the experience of mothers of people with Down Syndrome using family bathrooms in public places, describing the need to place paper towels on the floor to change diapers due to the lack of adequate changing tables [PERRY and KOZUB, 2011]. In this case, the study did not explicitly highlight the importance of implementing larger changing tables suitable for teenagers or adults that meet needs beyond children.

Other negative factors were explicitly mentioned by Mathews, Marshall, and Wilkinson [MATHEWS et al., 2020], who detailed reports from people with sensory and cognitive disabilities, especially the elderly, in public transport station bathrooms: dark and insufficient lighting with hard-to-find power switches; small and hidden entry signage; cramped space for movement with small sinks and countertops; colors in the environment causing diffuse perception, confusion, and anxiety, for example, a light toilet, sink, and toilet paper roll with a white wall and floor; auditory disturbance due to the loud sound emitted by hand dryers; and difficulty using automated equipment with proximity activation such as faucets, flushes, and lighting.

A public use physical environment should have positive characteristics to mitigate sensory stimuli for people with cognitive or sensory disabilities, such as reducing noise, introducing natural lighting, and legibility in signage using short phrases and symbols with accessible shapes and large fonts [BIGLIERI, 2020, SMALL et al., 2023, MASHIRI et al., 2005].

Moving through a built environment to seek the best route by analyzing decision points in space is called wayfinding [BOSCH and GHARAVEIS, 2017]. For passengers to understand the main journey route at the airport, implementing an orientation system offering them wayfinding with clear spatial orientation information is necessary. Thus, the following accessibility and wayfinding measures can be cited: using contrasting colors at reference points to improve memorization and decision-making in distinguishing one environment from another [BOSCH and GHARAVEIS, 2017]; implementing colors and symbols that facilitate visualization by users with disabilities who tend to look at the ground while moving; use of visual guides on the floor that help orientation or navigation for people with location difficulties; opting for clear lighting to help them see and interpret their environment, mainly recommending natural lighting [YEUNG, 2021].

Complementing the structural factors highlighted earlier, it is also essential to implement textual and symbolic indications that help people locate themselves. Effective signage helps alleviate passengers' cognitive stress or anxiety [O'REILLY et al., 2016, SYMONDS, 2017]. For those with sensory, intellectual, or cognitive disabilities, these signs should be well understood and explicit. Hunter and Hron [HUNTER and HRON, 1999b] recommend that signage use large and standardized letters with color and brightness contrast and adequate lighting for these elements to be well visualized. Additionally, these principles should be replicated in providing schedule information, especially for

Tabela 2
Distribution of Accessibility Recommendations in Four Technical Dimensions.

Needs	Recommendations	References
Planning the trip in advance	Providing online information according to web accessibility standards to help plan the air trip and request assistance.	Gabriels e Hill [CAA. Civil Aviation Authority 2010]; Skillicorn [SKILLICORN, 2013]; Deka, Feeley e Lubin [DEKA et al., 2016]; Neo e Flaherty [NEO and FLAHERTY, 2018]; Van Horn et al. [VAN HORN et al., 2020]; Dempsey et al. [DEMPSEY et al., 2021]; Chiscano [CHISCANO, 2021]; Lim et al. [LIM et al., 2021]; McDonnell et al. [MCDONNELL et al., 2021]; Peterson et al. [PETERSON et al., 2022]; Ali et al. [ALI et al., 2022]; Neven; Ectors, [NEVEN and ECTORS, 2023].
	Providing itineraries (physical or online) with accessible language describing the air travel stages using text, images, or videos.	Gabriels e Hill [CAA. Civil Aviation Authority 2010]; Hamed [HAMED, 2013]; Skillicorn [SKILLICORN, 2013]; Ruddy et al. [RUDDY et al., 2015]; Van Horn et al. [VAN HORN et al., 2020]; Dempsey et al. [DEMPSEY et al., 2021]; Chiscano [CHISCANO, 2021].
	Providing badge, lanyard, or other accessory to help identify and assist the passenger by operators and security agents.	O'Reilly et al. [O'REILLY et al., 2016]; Van Horn et al. [VAN HORN et al., 2020]; Yeung [YEUNG, 2021]; Peterson et al. [PETERSON et al., 2022]; Garzon [GARZON, 2023]; Small et al. [SMALL et al., 2023].
	Providing ways to communicate in advance with the operators who will provide assistance during the trip.	Hamed [HAMED, 2013]; Van Horn et al. [VAN HORN et al., 2020]; Lim et al. [LIM et al., 2021]; Peterson et al. [PETERSON et al., 2022]; Van Holstein; Wiesel; Legacy, [VAN HOLSTEIN et al., 2022].
Accessibility during the journey	Allowing passengers to visit the airport in advance to simulate the air travel stages.	Hamed [HAMED, 2013]; Skillicorn [SKILLICORN, 2013]; Dempsey et al. [DEMPSEY et al., 2021]; Small et al. [SMALL et al., 2023].
	Attention, empathy, and flexibility during the security control passage.	Skillicorn [SKILLICORN, 2013]; O'Reilly et al. [O'REILLY et al., 2016]; Chiscano [CHISCANO, 2021]; Small et al. [SMALL et al., 2023].
	Priority access in sectors involving waiting in lines such as check-in, security control, and boarding.	O'Reilly et al. [O'REILLY et al., 2016]; Sedgley et al. [SEDGLEY et al., 2017]; Dempsey et al. [DEMPSEY et al., 2021]; Chiscano [CHISCANO, 2021]; Lim et al. [LIM et al., 2021]; Zhao et al. [ZHAO et al., 2023].
	Assisting passengers to wait in lines in quiet, silent, and crowd-free places.	Hamed [HAMED, 2013]; Destin et al. [DESTIN et al., 2016]; Freund et al. [FREUND et al., 2019]; Van Horn et al. [VAN HORN et al., 2020]; Dempsey et al. [DEMPSEY et al., 2021]; Peterson et al. [PETERSON et al., 2022]; Tata et al. [TATA et al., 2024a].
Source: The authors. Operators' and agents' competencies	Developing communication or service skills for operators to conduct appropriate approaches according to the type of need, context, or environment.	Hunter e Hron [HUNTER and HRON, 1999a]; Darcy [DARCY, 2012]; Amet [AMET, 2013]; Hamed [HAMED, 2013]; Deka, Feeley e Lubin [DEKA et al., 2016]; Freund et al. [FREUND et al., 2019]; McCausland et al. [MCCAUSLAND et al., 2020]; Turner [TURNER, 2022]; Wood [WOOD, 2022]; Garzon [GARZON, 2023]; Neven; Ectors, [NEVEN and ECTORS, 2023]; Small et al. [SMALL et al., 2023]; Tata et al. [TATA et al., 2024a].
	Developing competencies to identify and assist passengers with neurodiverse behaviors.	Hunter e Hron [HUNTER and HRON, 1999a]; Hunter e Hron [HUNTER and HRON, 1999b]; Amet [AMET 2013]; Skillicorn [SKILLICORN, 2013]; Bigby et al. [BIGBY et al., 2019]; Freund et al. [FREUND et al., 2019]; Lim et al. [LIM et al., 2021]; McDonnell et al. [MCDONNELL et al., 2021]; Peterson et al. [PETERSON et al., 2022];
	Promoting in-person meetings at the airport between operators, people with hidden disabilities, and companions to foster interaction and experience sharing.	Skillicorn [SKILLICORN, 2013]; Chiscano [CHISCANO, 2021]; Dempsey et al. [DEMPSEY et al., 2021]; Turner [TURNER, 2022]; Van Holstein; Wiesel; Legacy, [VAN HOLSTEIN et al., 2022].
	Legibility in terminal maps and signage using synthesized and short phrases, symbols, or pictograms with accessible shapes or large fonts. All components should have color contrast (light and dark).	Hunter e Hron [HUNTER and HRON, 1999a]; Blackman et al. [BLACKMAN et al., 2003]; O'Neill e O'Mahony [O'NEILL and O'MAHONY, 2005]; Bigby et al. [BIGBY et al., 2019]; Biglieri [BIGLIERI, 2020]; Van Horn et al. [VAN HORN et al., 2020]; Peterson et al. [PETERSON et al., 2022]; Garzon [GARZON, 2023]; Neven; Ectors, [NEVEN and ECTORS, 2023]; Martín-Domingo et al. [MARTÍN-DOMINGO et al., 2024].
Usability of facilities	Accessibility recommendations in bathrooms for people with cognitive disabilities.	Mathews, Marshall e Wilkinson [MATHEWS et al., 2020]; Van Horn et al. [VAN HORN et al., 2020].
	Providing inclusive spaces such as sensory rooms or adapting waiting environments in common airport areas to adopt low sensory stimulus conduct, especially related to silence and tranquility.	Neo e Flaherty [NEO and FLAHERTY, 2018]; Van Horn et al. [VAN HORN et al., 2020]; Chiscano [CHISCANO, 2021]; Yeung [YEUNG, 2021]; Peterson et al. [PETERSON et al., 2022]; Wood [WOOD, 2022]; Garzon [GARZON, 2023]; Martín-Domingo et al. [MARTÍN-DOMINGO et al., 2024].
	Mitigating artificial lights, opting for less intense or natural lighting.	Skillicorn [SKILLICORN, 2013]; Bosch e Gharaveis [BOSCH and GHARAVEIS, 2017]; Freund et al. [FREUND et al., 2019]; Biglieri [BIGLIERI, 2020]; Van Horn et al. [VAN HORN et al., 2020]; Lim et al. [LIM et al., 2021]; Martín-Domingo et al. [MARTÍN-DOMINGO et al., 2024].
	Mitigating sensory stimuli generated by crowd gatherings or artificial noises (loudspeakers and other devices).	Lindqvist e Lundalv [LINDQVIST and LUNDÄLV, 2012]; Skillicorn [SKILLICORN, 2013]; Destin et al. [DESTIN et al., 2016]; Deka, Feeley e Lubin [DEKA et al., 2016]; Van Horn et al. [VAN HORN et al., 2020]; Biglieri [BIGLIERI, 2020]; Lim et al. [LIM et al., 2021]; Peterson et al. [PETERSON et al., 2022]; Zhao et al. [ZHAO et al., 2023]; Martín-Domingo et al. [MARTÍN-DOMINGO et al., 2024].

Source: The author's.

passengers with learning difficulties and large fonts [O'NEILL and O'MAHONY, 2005]. These principles help, for example, elderly individuals with cognitive impairments due to Alzheimer's disease, which causes difficulties in memorizing, learning new information, interpreting symbols, and navigating built environments.

Additionally, in specific contexts, pairing these signs with other sensory information, such as vibration, tactile text, or sound signals, is necessary to help understand the message [HUNTER and HRON, 1999b]. Moreover, studies also suggest strategies to facilitate spatial orientation through online maps available on the airport or airline website [HARDING et al., 2017] and visual or auditory instructions mediated by teams trained in communication [BIGBY et al., 2019].

Concerning structural accessibility needs, quiet waiting environments, such as sensory rooms, are also implemented [CHISCANO, 2021, VAN HORN et al., 2020]. People with sensory or cognitive disabilities demand these places mainly in the busiest airport sectors.

Some airports already have these environments with trained staff prepared to receive these passengers and their companions. These spaces can have features such as wavy walls, silence, and appropriate lighting to provide relief from the airport's hectic environment [NEO and FLAHERTY, 2018]. A strongly emphasized recommendation is providing quiet and tranquil spaces in common areas of airports [PETERSON et al., 2022]. This last alternative is more efficient considering the proposal of a sensory room generally dedicated to people with ASD.

Table 2 synthesizes the four categories related to the stages of air travel and a set of accessibility recommendations developed based on the contributions from the systematic literature review.

4. Final Considerations

Social behaviors such as anxiety, stress, and other conditions can be expected but challenging to identify by service providers. The information from the systematic literature review and the recommendations detailed in Table 2 can help understand some hidden needs of many passengers. This study explored the existing academic literature review on accessibility recommendations in general transport situations for passengers with disabilities. It is worth noting that most of the categorized recommendations in Table 2 already occur in many airports worldwide. This finding can be consulted in documents published by the Civil Aviation Authority [CAA. Civil Aviation Authority 2018]. Although these practices are adhered to in many US and European airports, they are recommendations that can be adopted in any air transport context, filling a scientific gap in summarizing a set of practices feasible in real civil aviation contexts.

The focus was mapping access requirements and accessibility solutions for airports and air travel. Based on theoretical and methodological contributions from the authors, the proposed recommendations need to be supported by two fundamental aspects.

First, according to official civil aviation regulations, and second, according to the reality of operators. Consequently, as future research proposals, it is suggested that these recommendations be validated with airport and airline operators mediating the assistance process and mapping civil aviation regulations to support these workers' proposed recommendations and actions. Moreover, this investigation contributes to potentially new investigations of necessary operator competencies to evolve accessibility from communication, access to information, attitudes, and technology implementation perspectives.

This study presents the following limitations: it covered only traditional databases that mainly have publications in English, which may have excluded contributions published in other languages such as Portuguese and Spanish; and specific terminologies used in the study search process predominantly associated with intellectual, cognitive, and learning disabilities, which may have omitted some studies encompassing other types of hidden disabilities.

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CRediT authorship contribution statement

Igor Dos Santos: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Sérgio Luis Da Silva:** Supervision, Methodology, Formal analysis, Data curation, Conceptualization. **João Alberto Camarotto:** Validation, Supervision, Methodology, Investigation, Data curation, Conceptualization.

Heloisa Giangrossi Machado Vidotti: Writing – review & editing, Validation, Supervision, Methodology, Data curation.

Data availability

Research Elements (Reference data) (Research Elements)

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