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Review Article

The Role of Artificial Intelligence in Supporting Accessibility for Persons with Disabilities: A Literature Review

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Abstract:

Artificial intelligence is increasingly discussed as a transformative approach to improving accessibility for persons with disabilities, particularly in health care, rehabilitation, education, communication, and daily living. This literature review synthesizes evidence on how artificial intelligence supports assistive technologies, adaptive learning, clinical monitoring, communication support, and disability-inclusive service delivery. A descriptive qualitative literature review was conducted using studies retrieved from PubMed and ScienceDirect and selected using a PRISMA-based flow. From 60 records identified, 40 full-text articles were included in the synthesis. The reviewed literature shows that artificial intelligence can improve independence and participation through screen readers, speech recognition, sign-language recognition, smart vision devices, wearable sensors, tele-rehabilitation, personalized education systems, and clinical decision-support tools. However, implementation remains limited by high cost, digital literacy gaps, infrastructure barriers, small and non-representative datasets, algorithmic bias, privacy concerns, and insufficient involvement of persons with disabilities in technology design. The review highlights that artificial intelligence should be developed through inclusive, user-centered, ethically governed, and context-sensitive approaches. Sustainable integration requires collaboration among health professionals, educators, technology developers, policymakers, caregivers, and disability communities.

Keywords: Artificial intelligence; Accessibility; Disability; Assistive technology; Rehabilitation.

1. Introduction

Persons with disabilities continue to face barriers in education, employment, communication, mobility, and access to health services. These barriers are not caused only by physical, sensory, cognitive, or mental impairments, but also by inaccessible environments, limited inclusive facilities, and persistent social stigma (1). The World Health Organization estimates that approximately 1.3 billion people globally live with a form of disability, making inclusive and accessible systems an urgent public health and social priority (2).

Rapid advances in artificial intelligence (AI) have created new opportunities to reduce accessibility barriers. AI refers to computational systems capable of learning from data, recognizing patterns, supporting decision-making, and adapting to user needs (3),(4). In disability contexts, these capabilities have enabled intelligent screen readers, speech-recognition tools, smart navigation systems, wearable sensors, conversational agents, and adaptive rehabilitation technologies (5),(6).

AI is relevant not only as an assistive tool but also as an enabling infrastructure for inclusive health care, rehabilitation, education, and social participation (5),(7),(8),(9),(10),(11),(12),(13). Recent reviews indicate that AI can personalize learning, support post-stroke and physical rehabilitation, monitor stress or nocturnal events, and improve communication for people with cognitive, visual, hearing, or speech-related disabilities (14),(15),(16),(17),(18),(19),(20).

Despite these advances, the implementation of AI for disability inclusion is uneven. Many systems remain limited by cost, lack of infrastructure, low digital literacy, small datasets, algorithmic bias, privacy concerns, and insufficient participation of persons with disabilities in the design process (6),(7),(8),(21),(22). These limitations are particularly important in low-resource settings where technology access and disability-inclusive policy support may be inadequate (23),(24),(25),(26).

This review aims to synthesize recent literature on the role of AI in supporting accessibility for persons with disabilities, with emphasis on assistive technology, rehabilitation, education, communication, adoption factors, ethical challenges, and future development needs.

2. Methods

This article was prepared as a descriptive qualitative literature review. The review examined scientific publications discussing the role of AI in improving accessibility and support for persons with disabilities. The approach was selected to synthesize evidence across diverse domains, including assistive technology, rehabilitation, health care, education, communication, and disability-inclusive design.

Literature searches were conducted in PubMed and ScienceDirect using combinations of the keywords "artificial intelligence", "accessibility", "disability", "assistive technology", "rehabilitation", "inclusive education", and related terms. The selection process followed a PRISMA-based flow consisting of identification, screening, eligibility assessment, and inclusion.

The inclusion criteria were full-text articles published within the last five years that discussed AI applications for persons with disabilities and presented a clear scientific method or conceptual framework. Articles were excluded if they were duplicate publications, did not focus on the review topic, lacked methodological clarity, or were not available in full text.

Table 1. PRISMA-based literature selection process

Stage	Result	Number of article
Identification	Records identified from PubMed and ScienceDirect	60
Deduplication	Duplicate records removed	8
Screening	Titles and abstracts screened	52
Screening	Records excluded as not relevant to the main topic	8
Eligibility	Full-text articles assessed for eligibility	44
Eligibility	Full-text articles excluded because they did not focus on the main topic	4
Included	Articles included in the final literature synthesis	40

3. Results

The final synthesis included 40 articles addressing AI and disability-related accessibility. The selected literature included systematic reviews, scoping reviews, narrative reviews, experimental studies, cohort studies, observational studies, qualitative studies, participatory co-design research, and conceptual papers (25),(27). The studies covered several disability contexts, including visual impairment, hearing impairment, speech and communication limitations, intellectual disability, cognitive impairment, neurodevelopmental disorders, learning disabilities, stroke-related disability, physical disability, and older adult rehabilitation (28),(29).

The evidence clustered into five broad themes: digital accessibility and assistive technology, health care and rehabilitation, inclusive education, communication and social participation, and adoption or ethical considerations. Across these themes, AI was generally described as a tool that can increase independence, improve personalization, expand access, and support decision-making. However, most studies also emphasized that real-world implementation remains limited by technical, social, economic, and ethical barriers (30).

Table 2. Thematic synthesis of reviewed literature

Theme	Representative AI applications	Main contribution	Key references
Digital accessibility and assistive technology	Screen readers, alternative content generation, smart glasses, AI-enabled assistive technology frameworks	Improves access to digital information, navigation, independence, and user-specific support.	(4), (8), (12), (17), (21), (25), (26), (27).
Health care and rehabilitation	Wearable sensors, AI rehabilitation assessment, tele-rehabilitation, predictive analytics, smart monitoring	Supports clinical evaluation, remote monitoring, personalized therapy, and continuity of care.	(3), (5), (9), (10), (11), (13), (16), (20), (23), (24), (31), (28), (29), (30), (32), (33).
Inclusive education	Adaptive learning systems, generative AI, personalized educational tools for neurodevelopmental and learning disorders.	Promotes individualized learning, academic participation, and inclusive higher education.	(15), (34), (35), (36).
Communication and social participation	Conversational agents, sign-language recognition, speech decoding from electroencephalography signals.	Enhances interaction for people with cognitive, hearing, speech, or severe communication disabilities.	(14), (18), (19).
Adoption, equity, and ethics	Co-design frameworks, disability-inclusive AI design, acceptance models, decision-making frameworks	Highlights the need for inclusive design, data fairness, affordability, training, and privacy protection.	(6), (7), (21), (22), (23), (24), (37), (38), (39).

4. Discussion

Role of AI in Disability Accessibility

AI contributes to disability accessibility by enabling systems that can recognize patterns, interpret user input, and respond adaptively to individual needs. In digital accessibility (4), AI supports speech recognition, text-to-speech, image description, automated accessibility evaluation, natural language processing, and computer vision (8),(9). These technologies help persons with disabilities interact with digital content and physical environments more independently.

The reviewed studies show that AI-based assistive technologies can improve independence, participation, and quality of life across disability groups (12),(17),(18). Smart vision devices may support reading and environmental awareness among people with visual impairment, while AI-driven communication tools can assist individuals with hearing, speech, or cognitive limitations (19). These applications demonstrate that AI can support access not only to information but also to daily activities, education, work, and social participation (26).

From a public health perspective, AI-enabled accessibility should be understood as part of a broader strategy to reduce participation restrictions (7),(21). The value of AI increases when technology is embedded in inclusive systems that address physical environments, social support, affordability, training, and policy protection (24),(25).

Implementation in Health Care and Rehabilitation

In health care and rehabilitation, AI has been applied for assessment, prediction, monitoring, and intervention (9),(10),(11). Machine learning and deep learning models can analyze movement patterns, evaluate rehabilitation exercises, detect stress in real time, and support recovery after stroke or other functional impairments

(16). These technologies can provide more objective measurements and allow personalized intervention planning (30),(32),(33).

AI also strengthens tele-rehabilitation and remote monitoring, which may be particularly useful for people who face barriers to traveling to health facilities (20). Wearable sensors, camera-based systems, and intelligent monitoring platforms can improve safety and continuity of care, although clinical validation and long-term evaluation remain necessary before wide-scale implementation (31),(32).

The clinical significance of AI in rehabilitation lies in its ability to combine real-time data, adaptive feedback, and individualized treatment pathways (3),(9),(16). However, the evidence remains heterogeneous, and many studies are still experimental or exploratory. More rigorous studies are needed to confirm effectiveness, safety, and usability in routine clinical practice (30),(33).

AI in Inclusive Education and Communication

AI can support inclusive education through adaptive learning systems, personalized assistive tools, and generative technologies that modify learning materials according to the needs of students with disabilities (15),(34). These systems may support students with neurodevelopmental disorders, learning disabilities, visual impairment, and cognitive limitations by adjusting content delivery, feedback, and learning pace (35),(36).

Communication is another major area of AI application. Conversational agents, sign-language recognition technologies, and speech decoding from electroencephalography signals have the potential to reduce communication barriers and improve social participation (14). Although these tools remain limited by dataset quality, language diversity, and real-world validation, they represent important directions for inclusive communication support (18),(19).

Educational and communication technologies should be designed with attention to usability, cultural context, and the lived experience of persons with disabilities (7),(21). Without these considerations, AI may reproduce existing barriers rather than remove them (27),(35).

Factors Influencing AI Adoption

Adoption of AI-based accessibility tools is influenced by technological, psychological, social, economic, and institutional factors (22),(37). Performance expectancy, effort expectancy, user confidence, perceived usefulness, social influence, affordability, infrastructure, and training all shape whether persons with disabilities accept and continue using AI tools (23),(24).

User-friendly design is central to successful adoption. Technologies that are difficult to learn, poorly adapted to specific disability needs, or incompatible with daily routines may not be used even when technically advanced (21),(22),(23). Conversely, tools that are practical, low cost, reliable, and co-designed with users are more likely to improve independence and participation (25).

In low-resource settings, infrastructure and affordability are particularly important. High device costs, limited internet access, and lack of training may widen the digital divide and prevent vulnerable groups from benefiting from AI innovation (6),(8),(22). Addressing these barriers requires policy support, service integration, and multidisciplinary collaboration (23),(24).

Challenges and Ethical Considerations

The reviewed literature consistently identifies ethical and technical challenges in AI for disability inclusion (4),(8). Limited and non-representative datasets may produce biased algorithms that perform poorly for certain disability groups. Bias is especially concerning when AI is used for clinical assessment, rehabilitation recommendations, digital access, or eligibility decisions (27).

Privacy and data security are also critical because many AI systems require sensitive health, behavioral, mobility, or communication data. Persons with disabilities may be exposed to additional risks if data governance is weak, consent processes are unclear, or systems are deployed without adequate safeguards (29).

Another ethical concern is the insufficient involvement of persons with disabilities in technology development. Several authors emphasize user-centered design, participatory co-design, and the disability justice

principle of "nothing about us without us". These approaches can help ensure that AI systems reflect real user needs and do not reinforce exclusion (21).

Future Perspectives

Future AI development for disability accessibility should prioritize inclusive datasets, transparent algorithms, clinical validation, affordability, and integration with existing health, education, and social service systems (25),(30) The combination of AI with Internet of Things, wearable technologies, big data, edge computing, and telehealth may enable more responsive and context-aware support (31).

Research should move beyond proof-of-concept studies toward real-world implementation studies that evaluate effectiveness, safety, usability, long-term outcomes, and equity (21),(36). Future studies should also include diverse disability groups and involve users, caregivers, clinicians, educators, and policymakers throughout the design and evaluation process (40).

For international and low-resource contexts, AI should be developed as a scalable and sustainable accessibility strategy rather than an isolated technology product. This requires ethical governance, public-private collaboration, training programs, and policies that ensure affordability and equitable access (24),(25).

5. Conclusion

Artificial intelligence has substantial potential to support accessibility for persons with disabilities by improving assistive technology, rehabilitation, education, communication, health monitoring, and participation in daily life. The reviewed literature shows that AI can provide adaptive, personalized, and efficient support, but its benefits depend on inclusive design, user involvement, affordability, infrastructure readiness, digital literacy, and ethical data governance. Current evidence also highlights persistent gaps, including limited real-world validation, biased datasets, privacy risks, high implementation costs, and uneven access. Therefore, AI should be developed and implemented through a disability-inclusive, user-centered, and multidisciplinary approach to ensure that technological innovation translates into meaningful improvements in independence, quality of life, and social inclusion.

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