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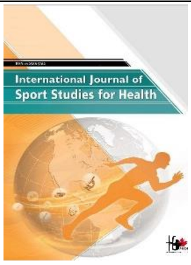

Voices of Recovery: Patients' Experiences with AI-Assisted Stroke Rehabilitation

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A B S T R A C T

Objective: This study aims to explore the lived experiences of stroke survivors engaging in AI-assisted rehabilitation.

Methods and Materials: This qualitative study was conducted with 14 stroke survivors undergoing AI-assisted rehabilitation at the York Rehab Center in Richmond Hill, Canada. Participants were recruited using purposive sampling, and data collection was carried out through in-depth, semi-structured interviews. Interviews lasted 45–60 minutes and were audio-recorded, transcribed verbatim, and coded using NVivo 14 software. Thematic analysis was employed following Braun and Clarke's six-phase framework. The study continued until theoretical saturation was achieved. Ethical considerations including informed consent and confidentiality were rigorously maintained throughout the research process.

Findings: Analysis revealed four main themes: (1) Human–Technology Interaction, including trust in AI and interface usability; (2) Emotional and Psychological Response, encompassing motivation, emotional bonding with technology, and performance anxiety; (3) Perceived Effectiveness of Rehabilitation, including functional improvement, personalized feedback, and therapy comparison; and (4) Social and Institutional Context, focusing on relationships with therapists, digital equity, and cultural influences. Patients generally found the AI systems to be engaging and supportive of their physical recovery. However, emotional detachment, dependence, and accessibility challenges emerged as concerns. Participants emphasized the need for human involvement alongside AI systems to ensure emotional and motivational support.

Conclusion: AI-assisted rehabilitation was perceived as a promising and effective complement to traditional therapy, enhancing functional outcomes and patient engagement. However, its full potential lies in hybrid models that integrate human empathy with technological precision.

Keywords: *AI-assisted rehabilitation; stroke recovery; patient experience; human–technology interaction; qualitative study; neurorehabilitation*

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1. Introduction

Stroke remains one of the leading causes of long-term disability worldwide, affecting millions of individuals with varying degrees of motor, cognitive, and psychological impairments. As the global burden of stroke continues to rise, particularly in aging populations, the demand for innovative, effective, and accessible rehabilitation strategies has intensified. In response to this need, artificial intelligence (AI) has emerged as a transformative force in post-stroke rehabilitation, promising enhanced personalization, efficiency, and patient engagement through data-driven technologies (1). Among the various applications of AI in healthcare, its integration into neurorehabilitation systems—through smart robotics, machine learning algorithms, and brain–computer interfaces—has opened new avenues for optimizing recovery trajectories in stroke survivors (2, 3).

Recent years have seen an increasing focus on AI-driven interventions aimed at improving functional outcomes after ischemic stroke. Technologies such as AI-guided exoskeletons, motion capture systems, and intelligent feedback loops are enabling more adaptive and responsive rehabilitation environments (4, 5). These systems not only assist in executing physical movements but also monitor performance metrics, adjust difficulty levels in real time, and provide motivational feedback to patients, all of which are critical in maintaining engagement and promoting neuroplasticity (6). In addition, the ability of AI platforms to analyze multimodal data from sensors, imaging, and patient records allows for precise assessment and personalized therapy planning, potentially reducing the reliance on standardized, one-size-fits-all protocols (7, 8).

While these technological advancements offer exciting possibilities, their successful implementation depends on understanding how patients perceive and interact with such systems. Rehabilitation, particularly in the context of stroke recovery, is not merely a technical process but a deeply personal journey involving psychological adaptation, motivation, and emotional resilience. Consequently, there is a growing recognition that qualitative explorations of patient experiences with AI-assisted rehabilitation are essential to complement clinical outcome data (9, 10). Studies suggest that patients' attitudes toward technology, their sense of agency, and their trust in AI systems significantly influence adherence, satisfaction, and ultimately, functional recovery outcomes (11, 12).

This study addresses a critical gap in the literature by investigating the lived experiences of stroke survivors who have undergone AI-assisted rehabilitation. Unlike previous research that primarily quantifies effectiveness based on neurological or physiological metrics (12, 13), this study foregrounds patient voice, aiming to understand how individuals perceive, interpret, and emotionally respond to AI-supported interventions during their recovery process. Such an inquiry is especially relevant in the context of personalized medicine, where the patient's perspective is increasingly valued in therapeutic decision-making (14, 15).

Technological optimism surrounding AI has been bolstered by studies demonstrating its potential to improve motor learning and neurocognitive function post-stroke. For instance, machine learning algorithms have been used to predict walking independence with high accuracy, thereby enabling more informed treatment planning (7). In parallel, brain–computer interfaces and myoelectric prosthetics are being explored as tools to re-establish motor control by decoding neural signals and translating them into movement commands (2). These innovations reflect a broader trend toward closed-loop rehabilitation systems that integrate real-time patient feedback, AI-based decision-making, and adaptive interventions to facilitate recovery in a more intelligent and autonomous manner (6).

Yet, despite the proliferation of such technologies, questions remain regarding their accessibility, equity, and psychological impact. Evidence suggests that while AI-assisted systems can enhance therapy intensity and continuity, disparities in digital literacy, socioeconomic status, and institutional readiness may limit their widespread adoption (16, 17). Furthermore, the degree to which patients feel emotionally supported by machines, or whether AI systems can replicate the therapeutic alliance traditionally established with human therapists, is still under investigation (18, 19). These concerns are particularly salient for older adults who may harbor skepticism or anxiety about interacting with intelligent machines (20).

Moreover, the neurobiological dimensions of stroke recovery further complicate the integration of AI in rehabilitation. Emerging studies have shown that dynamic functional connectivity in the brain—a biomarker for neuroplastic potential—can be disrupted by stroke and modulated by rehabilitation intensity and feedback (21). AI systems that monitor and adapt to such brain-level changes could optimize recovery, yet this possibility also raises ethical and psychological considerations about autonomy, privacy, and the limits of human–machine co-adaptation (22, 23).

In light of these complexities, it is important to explore how patients themselves interpret their experiences with AI-assisted rehabilitation. Do they find the systems motivating, alienating, empowering, or intrusive? How do they navigate the tension between human care and algorithmic precision? What forms of emotional attachment or resistance do they develop in response to AI interfaces? And how do these subjective perceptions align—or conflict—with clinical markers of success? These questions are not merely academic; they are central to designing AI systems that are not only effective but also ethically attuned and psychologically responsive (24, 25).

This qualitative study seeks to answer these questions by conducting in-depth, semi-structured interviews with 14 stroke survivors who have used AI-based rehabilitation systems at the York Rehab Center in Richmond Hill, Canada. By employing thematic analysis and leveraging NVivo-14 software, the study aims to identify core themes in patients' narratives, including their emotional responses, perceived benefits and limitations of AI tools, and the social and institutional contexts that shape their rehabilitation journeys. In doing so, it contributes to a growing body of interdisciplinary research that bridges neuroscience, health technology, and patient-centered care (1, 3, 14).

Importantly, the findings of this study have practical implications for the design and deployment of future AI-enabled rehabilitation systems.

2. Methods and Materials

2.1 Study Design and Participants

This study employed a qualitative research design to explore the lived experiences of stroke patients engaging with AI-assisted rehabilitation technologies. The aim was to gain an in-depth understanding of how patients perceive, interact with, and are affected by AI-driven interventions during their recovery process. The interpretive paradigm guided the research, emphasizing subjective meaning and personal narratives.

Participants were recruited through purposive sampling from among stroke survivors receiving care or attending post-treatment programs at the York Rehab Center in Richmond Hill, Ontario, Canada. Eligibility criteria included being a stroke survivor over the age of 18, having experienced at least four weeks of AI-assisted rehabilitation (such as robotic therapy, AI-based motion tracking, or virtual feedback systems), and possessing sufficient cognitive and communicative ability to participate in an interview. A total of 14 participants were interviewed, with recruitment continuing until theoretical saturation was reached—that is, no new themes or insights emerged in subsequent interviews.

2.2 Data Collection

Data collection was conducted through in-depth, semi-structured interviews designed to elicit detailed personal narratives about participants' engagement with AI-assisted stroke rehabilitation. The interview protocol was developed based on a review of the literature and input from rehabilitation specialists to ensure relevance and comprehensiveness. Key domains included participants' initial expectations of AI systems, their experiences during therapy, perceptions of progress, trust in technology, and perceived limitations or challenges.

Interviews were conducted in person at the York Rehab Center or via secure video conferencing platforms, depending on participant preference and mobility constraints. Each interview lasted approximately 45 to 60 minutes and was audio-recorded with participants' informed consent. Field notes were also taken to capture non-verbal cues and contextual observations.

2.3 Data Analysis

All audio recordings were transcribed verbatim and entered into NVivo 14 software for systematic qualitative analysis. Thematic analysis was used to identify, code, and interpret patterns within the data. The analysis followed Braun and Clarke's six-phase framework: familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. Both inductive and deductive coding approaches were used to ensure that emergent themes were grounded in the data while also aligning with the research objectives.

To ensure credibility and trustworthiness, multiple strategies were employed, including peer debriefing, reflective memo writing, and member checking with a subset of participants. Analytical decisions were documented throughout the process to support transparency and dependability. The resulting themes were refined collaboratively by the research team to ensure coherence and resonance with the lived experiences of the participants.

3. Results

The study included 14 stroke survivors (8 males and 6 females) who had undergone AI-assisted rehabilitation at the York Rehab Center in Richmond Hill, Canada. Participants ranged in age from 42 to 78 years, with a mean age of 61.4 years. The majority of participants (n = 9) were over the age of 60, while 5 were between 40 and 59 years old. In terms of time since stroke onset, 6 participants were within their first year of recovery, 5 had been in recovery for 1 to 2 years, and 3 were beyond the two-year mark. Regarding their experience with AI-assisted rehabilitation, 10 participants had used the technology for more than eight weeks, while 4 had been engaged for four to eight weeks. Most participants (n = 11) had no prior experience with rehabilitation technology before this intervention. Educational backgrounds varied: 5 participants had completed high school, 6 held college or university degrees, and 3 had graduate-level education.

Table 1. Thematic Structure of Participants' Experiences in AI-Assisted Stroke Rehabilitation

Main Theme (Category)	Subtheme (Subcategory)	Concepts (Open Codes)
1. Human–Technology Interaction	Trust in AI Systems	Predictable responses, Safety perceptions, Initial skepticism, Gaining confidence
	Perceived Intelligence of AI	Real-time corrections, Learning behavior, Precision of movements
	Humanization of Technology	Feeling watched, Talking to the system, Machine as a companion
	Dependency on Technology	Reluctance to switch to manual rehab, Relying on system prompts, Missed feedback when absent
	Interface Usability	Easy navigation, Confusing menus, Visual clarity, Responsive touch system
	Engagement through Gamification	Enjoyable challenges, Competing with self, Points and rewards
2. Emotional and Psychological Response	Motivation and Hope	Feeling progress, Renewed energy, Positive outlook, Encouragement to continue
	Frustration and Anxiety	Fear of making errors, Overwhelmed by tasks, Pressure from performance tracking
	Perception of Control	Adjusting pace, Choosing exercises, Self-monitoring
	Emotional Bonding with the System	Talking to machine, Missing interaction, Naming the robot
	Fear of Replacement	Worry about losing human therapists, Feeling devalued, Skepticism about AI replacing care
3. Perceived Effectiveness of Rehabilitation	Functional Improvements	Better arm movement, Improved walking, Faster reaction time, Less fatigue
	Personalized Feedback	Targeted corrections, Progress indicators, Audio-visual cues
	Clarity of Progress	Tracking charts, Seeing results daily, Milestone achievements
	Comparison with Traditional Therapy	More feedback, Less boredom, Greater independence, More structured
	Therapy Continuity	Regular sessions, No delays, Flexible scheduling
	Cognitive Stimulation	Memory exercises, Thinking games, Dual-task training
4. Social and Institutional Context	Relationship with Therapists	Blended interaction, Therapist interpreting AI data, Therapist as emotional support
	Peer Influence and Social Comparison	Talking with others in rehab, Comparing scores, Feeling inspired
	Accessibility and Equity	High cost concerns, Access limited to certain clinics, Tech literacy issues
	Institutional Trust in Technology	Belief in clinic's choices, Assumption of expert validation, Comfort from staff training
	Cultural and Family Influence	Family encouragement, Stigma around machines, Cultural beliefs about healing

Category 1: Human–Technology Interaction

Trust in AI Systems: Participants described a gradual development of trust in the AI systems as they used them repeatedly in therapy. Initial skepticism was often replaced by confidence as the machines demonstrated consistent, safe, and accurate behavior. One participant noted, *"At first I thought it would make mistakes, but it actually guided me better than I expected."* Others emphasized that predictability and perceived safety enhanced their sense of security during exercises.

Perceived Intelligence of AI: Several participants commented on the "smartness" of the AI systems, especially in their ability to correct motion in real time. The systems were often perceived as learning from users. One interviewee explained, *"It noticed when I kept twisting my wrist wrong and adjusted the game so I had to fix it."* Such responsiveness fostered a sense of working with an adaptive partner rather than a rigid machine.

Humanization of Technology: Interestingly, some patients reported anthropomorphizing the system, referring to it as a "he" or "she" and even talking to it during sessions. This sense of presence helped reduce feelings of loneliness. A participant shared, *"Sometimes I joked with the machine like it was a person cheering me on."* This emotional projection provided comfort, particularly in sessions without a therapist present.

Dependency on Technology: A number of participants expressed an emerging dependence on AI tools, noting difficulty when transitioning back to traditional or manual therapies. One patient remarked, *"When the screen was down for maintenance, I felt lost—like I didn't know how to move properly without the cues."* This reliance raised questions about long-term self-efficacy in rehabilitation without AI support.

Interface Usability: Most participants found the interface accessible, although some noted difficulties with navigation or understanding prompts initially. Comments such as *"The touch screen was clear, and the instructions were easy to follow"* were common, while others struggled with *"menus that had too many choices or small text."* Clarity and responsiveness of the interface were crucial for maintaining engagement.

Engagement through Gamification: Gamified elements of the system were frequently highlighted as motivating. Patients appreciated point systems, levels, and performance feedback. *"I liked beating my previous score—it made therapy feel less like a chore,"* said one participant. Others described feelings of enjoyment and accomplishment, which boosted commitment to the rehab process.

Category 2: Emotional and Psychological Response

Motivation and Hope: Participants widely reported that using AI-assisted tools gave them a renewed sense of motivation and hope. The measurable progress and engaging design helped them stay focused. *"Seeing the numbers go up made me believe I was getting better,"* one participant said. The system provided immediate gratification through visualized gains, which participants associated with psychological upliftment.

Frustration and Anxiety: Despite overall positivity, many participants also described moments of frustration, particularly when they failed to meet a performance goal. Some reported anxiety about being constantly monitored or making visible errors. As one participant put it, *"It shows every mistake—you can't hide it. That made me nervous at first."* Others noted that the system sometimes pushed them too hard or too fast.

Perception of Control: Feeling in control of the rehabilitation process was an important theme. Many appreciated the ability to select exercises or adjust difficulty levels. *"I liked that I could choose which activity to do—it made me feel more in charge,"* shared one participant. This autonomy contributed to increased confidence and perceived ownership over their recovery.

Emotional Bonding with the System: Some participants developed emotional connections to the machine itself, referring to it affectionately and expressing missing it when absent. *"It felt like my coach. I even said goodbye to it when I finished therapy,"* one person reflected. This emotional attachment suggests that technology may fulfill relational needs, especially in solitary or repetitive therapy sessions.

Fear of Replacement: A smaller subset of participants voiced concerns about the system potentially replacing human therapists. *"I trust the machine, but I don't want it to take my therapist's place,"* expressed one participant. These concerns reflected a deeper unease about the impersonality of technology in contexts traditionally associated with human empathy and care.

Category 3: Perceived Effectiveness of Rehabilitation

Functional Improvements: Most participants reported perceivable physical improvements attributed to their use of the AI-assisted system. These included enhanced limb mobility, balance, and endurance. *"I could finally lift my arm above my head without pain after a few weeks,"* said one interviewee. Such outcomes reinforced their belief in the effectiveness of the technology.

Personalized Feedback: The system's ability to deliver tailored feedback was viewed as a significant advantage. Participants valued how the system adapted exercises to their abilities and offered corrections. *"It told me exactly which part of my movement was off,"* one person said. This precision facilitated more focused and efficient recovery.

Clarity of Progress: The visual representation of progress, such as charts or scores, was another motivating factor. *"I could see my numbers improve session by session—that kept me going,"* one participant commented. Quantified self-tracking helped individuals connect their efforts with tangible results.

Comparison with Traditional Therapy: AI-assisted rehabilitation was often evaluated against conventional therapy, with many participants favoring the former. *"Traditional therapy was good, but this gave me more feedback and kept me more engaged,"* one individual observed. The system's structure and interactive elements were seen as beneficial, particularly in maintaining attention and discipline.

Therapy Continuity: The consistent availability of the AI system enabled uninterrupted therapy schedules, which participants appreciated. *"With the AI, I didn't have to wait for a free slot or worry about cancellations,"* shared one patient. This accessibility ensured better adherence and fewer missed sessions.

Cognitive Stimulation: Participants also noted improvements in concentration and mental alertness. *"Some exercises made me think, not just move,"* said a participant. Dual-task features (requiring both cognitive and physical effort) were valued for enhancing overall mental engagement during rehab.

Category 4: Social and Institutional Context

Relationship with Therapists: While AI provided significant support, participants still emphasized the importance of human therapists in interpreting data and offering encouragement. *"The machine told me what to do, but my therapist told me why and how to do it better,"* explained one participant. The combination of human and machine input was often described as optimal.

Peer Influence and Social Comparison: Social interaction with other patients using AI systems also shaped experiences. Participants noted how seeing others progress motivated them. *"When I saw others getting better with it, I felt like I could too,"* one interviewee said. Some even shared tips or compared progress scores, adding a social layer to the technology use.

Accessibility and Equity: Despite its benefits, concerns about access and affordability were raised. Participants mentioned the high cost of AI-assisted therapy and limited availability in public facilities. *"Not everyone can afford this, and that doesn't feel fair,"* one participant remarked. Digital literacy also emerged as a barrier for some older users.

Institutional Trust in Technology: Participants frequently mentioned that their willingness to use the system was influenced by trust in the institution providing it. *"If the clinic believes in it, then I feel safe using it,"* said one participant. Confidence in the rehabilitation center's expertise played a role in their acceptance of AI tools.

Cultural and Family Influence: Family support and cultural attitudes toward technology influenced engagement with the system. Some families were enthusiastic and encouraging, while others were skeptical or fearful. *"My son told me to try it, that it's the future of healing,"* shared one interviewee. Others noted cultural resistance: *"In my culture, we prefer human touch over machines."*

4. Discussion and Conclusion

The present study explored the lived experiences of stroke survivors engaged in AI-assisted rehabilitation, revealing four major themes: human–technology interaction, emotional and psychological responses, perceived effectiveness of rehabilitation, and social and institutional contexts. Participants described the AI systems as intelligent, responsive, and, at times, emotionally engaging, highlighting their role in both physical recovery and psychological motivation. At the same time, concerns regarding over-dependence, usability challenges, and emotional distance from the machine emerged, suggesting a complex and multifaceted relationship between patients and AI-driven technologies.

The theme of trust and perceived intelligence in AI systems emerged as a foundational element in shaping patients' engagement. Participants initially approached the technology with hesitation but grew to trust it as it demonstrated reliable feedback and progress tracking. This aligns with findings from studies on smart rehabilitation devices that emphasize the importance of perceived safety and adaptive learning in fostering user confidence (1, 3). In similar research on smart hand rehabilitation systems, interface responsiveness and error correction were found to increase trust and ease of use among stroke survivors (1). These results also resonate with clinical observations that AI-driven feedback enhances motor relearning by simulating therapist-led correction through machine precision (2, 6).

A notable and somewhat unexpected finding was the humanization of technology. Several participants reported emotional bonding with AI systems, treating them as companions or "coaches" during solitary rehab sessions. While AI lacks emotional sentience, its consistent presence and encouraging feedback appeared to fill gaps in social interaction, particularly for individuals without continuous human therapist contact. This phenomenon echoes findings in pediatric AI learning environments, where children personified AI writing tools and showed improved motivation as a result (9). The emotional dimension of AI use in rehabilitation, although understudied, may hold potential for designing affective computing elements into future devices.

Participants also emphasized their emotional responses, ranging from hope and motivation to anxiety and frustration. These responses were shaped not only by the system's feedback mechanisms but also by the patients' internal expectations and recovery pace. When progress was visible, motivation increased; conversely, delayed or unclear improvements often led to discouragement. This reflects the role of reward-based learning in motor rehabilitation, where performance-linked feedback enhances neuroplasticity and adherence (11). Studies have demonstrated that motivational elements such as real-time performance feedback or gamified systems increase the engagement of stroke patients and sustain participation in longer rehabilitation regimens (4, 5).

However, a portion of participants expressed frustration with constant monitoring and fear of error exposure, feeling "watched" or judged by the system. This aligns with findings in AI diagnostic settings where patients or users sometimes react negatively to high levels of algorithmic transparency or behavioral tracking (8). These observations highlight the need to balance precision and empathy in AI design. While data-driven systems can enhance personalization, their over-reliance on metrics may trigger psychological pressure, especially in cognitively or emotionally vulnerable populations.

The study also revealed that AI-supported systems were widely perceived as effective in facilitating functional recovery, especially in areas such as limb mobility, balance, and endurance. Participants attributed their improvements to personalized feedback, repetitive task design, and adaptive difficulty. These perceptions are well-supported by clinical literature. For instance, research on the integration of smart rehabilitation robots and brain–computer interface systems has shown statistically significant improvements in functional independence and motor scores among stroke survivors using AI-enhanced protocols (2, 3). Similarly, real-world data on human urinary kallidinogenase and its combination with neuro-supportive agents has indicated functional improvement, particularly when coupled with AI-monitored interventions (12, 13).

Another important finding was the enhanced awareness of progress through visual tracking features. Participants reported that progress charts, achievement levels, and quantitative summaries provided a tangible sense of accomplishment. This form of biofeedback, when aligned with AI analysis, can boost cognitive-behavioral reinforcement and support long-term commitment to therapy (15, 21). Similar insights have been drawn from studies that leveraged neuroimaging and dynamic connectivity analyses, which highlight the importance of consistent feedback loops in stimulating neural reorganization after stroke (21).

Interestingly, participants frequently compared AI-assisted therapy with traditional therapist-led approaches. While AI systems were praised for their consistency, availability, and objectivity, they were also seen as emotionally distant. Many patients viewed the optimal model as a hybrid one—combining human empathy with machine precision. This dual preference reflects growing consensus in the rehabilitation literature that the best outcomes result from "augmented human-AI collaboration," rather than full automation (6, 7). Moreover, evidence shows that AI can enhance, rather than replace, therapist-patient relationships by supplying more accurate performance data for tailored human interventions (17, 18).

The study also illuminated concerns about access and digital inequality. Participants raised issues of cost, availability, and digital literacy, indicating that not all patients could equally benefit from AI-enhanced rehab. This mirrors broader concerns in the literature about the uneven diffusion of smart technologies in clinical settings (16, 20). Moreover, participants from non-technologically literate backgrounds or those with limited family support were more likely to feel isolated or overwhelmed when introduced to AI systems. These barriers emphasize the need for inclusive, culturally sensitive implementation strategies to ensure equitable access.

Cultural and familial factors were also noted as shaping engagement. For some, family encouragement boosted confidence in using AI; for others, cultural reservations about technology hindered acceptance. Such findings parallel those in global stroke care research, where sociocultural beliefs significantly influence treatment choices and adherence (10, 19). This underscores the importance of context-specific adaptation of AI systems to meet the emotional and cultural needs of diverse patient populations.

The final thematic insight relates to the role of the healthcare institution. Participants' acceptance of the AI system was often mediated by their trust in the rehab center and staff. Institutional endorsement was seen as a form of validation, increasing users' confidence in the system's credibility. This is consistent with findings that organizational support and staff training significantly influence technology uptake in clinical rehabilitation environments (22, 24). Trust in the system was rarely derived from the technology itself, but rather from the perceived competence and commitment of the human professionals implementing it.

Taken together, these findings contribute to a growing body of research that views AI-assisted stroke rehabilitation not just through the lens of biomechanical recovery, but also as a psychosocial and relational process. They confirm that the effectiveness of AI-enhanced rehabilitation is intertwined with user perception, emotional readiness, and the social ecosystem in which the technology is embedded. As such, technical optimization alone will not suffice; design must also account for the nuanced emotional, cognitive, and cultural variables that shape the user experience (23, 25).

This study has several limitations. First, the sample size was relatively small and limited to patients from a single rehabilitation center in Canada, which may affect the generalizability of the findings to broader populations or different healthcare settings. Second, while theoretical saturation was achieved, the nature of qualitative research means that some nuanced or minority perspectives may have been missed. Third, the study focused solely on patients' experiences and did not include perspectives from therapists or caregivers, whose insights could have further enriched the analysis. Additionally, the study did not stratify experiences by age, gender, or stroke severity, which may have offered more granular understanding of patient variability in technology interaction.

Future research should explore patient experiences across multiple rehabilitation centers and cultural contexts to gain comparative insights into the social and institutional dimensions of AI adoption. Longitudinal qualitative designs could be used to capture how perceptions of AI evolve over the entire rehabilitation trajectory, from early recovery to long-term integration. It is also essential to include the voices of therapists, caregivers, and system developers to triangulate findings and promote more holistic system design. Investigating the emotional and cognitive effects of human-like features—such as voice or facial expression—in AI systems may also offer new directions in designing emotionally responsive rehabilitation technologies.

Rehabilitation centers should consider offering blended therapy models that integrate AI with ongoing therapist support, preserving the human connection while enhancing precision. Training programs for both patients and staff should address digital literacy gaps and build confidence in using AI systems. User feedback should be routinely incorporated into system updates to ensure that interfaces remain intuitive and emotionally supportive. Finally, equitable access must be prioritized by considering affordability, language options, and culturally responsive features in AI design and implementation.

Authors' Contributions

All authors equally contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

References

1. Zou Z. Design and Interaction Optimization of Smart Hand Rehabilitation Assistive Devices for Stroke Patients. Computer Fraud & Security. 2025:1258-66. [DOI]
2. Singh A. From Mind to Motion: The Promise of Brain Computer Interfaces and Myoelectric Prosthetics for Stroke Neurorehabilitation. Interantional Journal of Scientific Research in Engineering and Management. 2025;09(02):1-9. [DOI]
3. Kishor I, Goyal P, Gantla HR, Goyal P, Mamodiya U. AI-Driven Haptic Technologies Revolutionizing Patient Rehabilitation. 2025:47-84. [DOI]
4. Baysal Z. AI-Driven Rehabilitation Robots: Enhancing Physical Therapy for Stroke and Injury Recovery. Nflsai. 2024;8(1):155. [DOI]
5. Hao M, Wang X, Tao W, Sheng C. Repetitive Transcranial Magnetic Stimulation Combined With Ginkgo Diterpene Lactone Meglumine Injection Recover Cognitive and Neurological Functions of Patients With Acute Ischemic Stroke.

Actas Esp Psiquiatr. 2025;53(1):110-8. [PMID: 39801416] [PMCID: PMC11726206] [DOI]
6. Reis TC, Machado A. Advancing Post-Stroke Rehabilitation: Emerging and Current Neuromodulation Approaches and Integration of Artificial Intelligence-Driven Closed-Loop Systems. Sensory Neuroscience. 2025;1(1). [DOI]
7. Ono K, Takahashi R, Morita K, Ara Y, Abe S, Ito S, et al. Can AI Predict Walking Independence in Patients With Stroke Upon Admission to a Recovery-Phase Rehabilitation Ward? Japanese Journal of Comprehensive Rehabilitation Science. 2024;15(0):1-7. [PMID: 38690086] [PMCID: PMC11058712] [DOI]
8. Hsiao C-C, Cheng C-G, Chen C-C, Chiu HW, Lin HC, Cheng CA. Semantic Visualization in Functional Recovery Prediction of Intravenous Thrombolysis Following Acute Ischemic Stroke in Patients by Using Biostatistics: An Exploratory Study. Journal of Personalized Medicine. 2023;13(4):624. [PMID: 37109009] [PMCID: PMC10143597] [DOI]
9. Wong LH, Aw GP, Sun H, Yen CC, Teo CG, Wen Y. Effects of a Machine Learning-Empowered Chinese Character Handwriting Learning Tool on Rectifying Legible Writing in Young Children: A Pilot Study. Icce. 2023. [DOI]
10. Tran LV, Alvarez XA, Le H-A, Nguyen D-A, Le TN, Nguyen PN, et al. Clinical Efficacy of Cerebrolysin and Cerebrolysin Plus Nootropics in the Treatment of Patients With Acute Ischemic Stroke in Vietnam. CNS & Neurological Disorders - Drug Targets. 2022;21(7):621-30. [PMID: 34414874] [DOI]
11. Paul T, Wiemer VM, Günther J, Lehnberg FM, Grafton ST, Fink GR, et al. Reward Enhances Motor Adaptation Learning in Acute Stroke Patients. 2024. [DOI]
12. Zhang Y, Luo X, Song X, Li J, Liu Y, Wang L, et al. Efficacy of Human Urinary Kallidinogenase in Real-World Patients With Acute Ischemic Stroke. The Neurologist. 2025. [DOI]
13. Zhang Y, Zhou F, Li H, Lei J, Mo Z, Li G, et al. Efficacy and Safety of Dl-3-N-Butylphthalide Combined With Human Urinary Kallidinogenase in the Treatment of Acute Ischemic Stroke. Clinical Neuropharmacology. 2023;46(2):60-5. [PMID: 36790373] [DOI]
14. Chen J, Gao X, Liang J, Wu Q, Shen L, Zheng Y, et al. Association Between Gut Microbiota Dysbiosis and Poor Functional Outcomes in Acute Ischemic Stroke Patients With COVID-19 Infection. Msystems. 2024;9(6). [PMID: 38700338] [PMCID: PMC11237522] [DOI]
15. Lu J, Zhang L, Zhang Y, Mao H, Fang Q. Intravenous Thrombolysis and Risk of Early-Onset Post-Stroke Depression: A Propensity Score Matched Cohort Study. Frontiers in Neurology. 2024;15. [PMID: 39618840] [PMCID: PMC11605618] [DOI]
16. Li Z, Pang M, Yu Y, Peng T, Hu Z, Niu R, et al. Effect of Different Ventilation Modalities on the Early Prognosis of Patients With Sleep Apnea After Acute Ischemic Stroke——protocol for a Prospective, Open-Label and Randomised Controlled Trial. BMC Neurology. 2023;23(1). [PMID: 37280508] [PMCID: PMC10243031] [DOI]
17. Jiang R, Lai Y-T. Predictive Role of Neuron-Specific Enolase and S100-B in Early Neurological Deterioration and Unfavorable Prognosis in Patients With Ischemic Stroke. Open Medicine. 2024;19(1). [PMID: 39669377] [PMCID: PMC11635423] [DOI]
18. Couture L, Cahuiche AE, Petway A, Baskin LS, Colpo GD, McCullough LD. Abstract 422: The Impact of Household Composition on Acute Ischemic Strokes: Acute and Chronic Implications. Stroke Vascular and Interventional Neurology. 2024;4(S1). [DOI]
19. Taleb S, Lee JJ, Duncan PW, Cramer SC, Hosseini MB, Su M, et al. Essential Information for Neurorecovery Clinical Trial Design: Trajectory of Global Disability in First 90 Days post-Stroke in Patients Discharged to Acute Rehabilitation Facilities. BMC Neurology. 2023;23(1). [PMID: 34414874] [PMCID: PMC10280859] [DOI]
20. Sablić S, Dolić K, Kraljević I, Budimir D, Čičmir-Vestić M, Benzon B, et al. The Presence of Communicating Arteries in the Circle of Willis Is Associated With Higher Rate of Functional Recovery After Anterior Circulation Ischemic Stroke. Biomedicines. 2023;11(11):3008. [PMID: 38002008] [PMCID: PMC10669712] [DOI]
21. Bonkhoff AK, Schirmer MD, Bretzner M, Etherton MR, Donahue K, Tuozzo C, et al. Abnormal Dynamic Functional Connectivity Is Linked to Recovery After Acute Ischemic Stroke. Human Brain Mapping. 2021;42(7):2278-91. [PMID: 33650754] [PMCID: PMC8046120] [DOI]
22. Taleb S, Lee JJ, Duncan PW, Cramer SC, Hosseini MB, Su M, et al. Essential Information for Neurorecovery Clinical Trial Design: Trajectory of Global Disability in First 90 Days Poststroke in Patients Discharged to Acute Rehabilitation Facilities. 2022. [DOI]
23. Gao J, Shao X, Guan Y, Mei J. Effect of Danhong Injection on Neurological Recovery and Adverse Events in Patients With Acute Ischemic Stroke. Medicine. 2021;100(46):e27683. [PMID: 34797293] [PMCID: PMC8601334] [DOI]
24. Li Y, Wang W, Yang H, Guo W, Feng J, Yang D, et al. Negative Correlation Between Early Recovery and Lipoprotein-Associated Phospholipase A2 Levels After Intravenous Thrombolysis. Journal of International Medical Research. 2022;50(4). [PMID: 35441552] [PMCID: PMC9047848] [DOI]
25. Kaur D. A Comparative Analysis of Diagnostic Imaging in Acute Ischaemic Stroke. Chettinad Health City Medical Journal. 2023;12(02):3-8. [DOI]