

https://dspace.org/

Capitalizing on digital health care for SpeechLanguage Pathology and Audiology professions to be contextually relevant responsive and responsible in South Africa A narrative review

Katijah Khoza-Shangase

AMER SPEECH-LANGUAGE-HEARING ASSOC
https://hdl.handle.net/10539/47200
WOS

Downloaded from a DSpace repository. https://dspace.org/

Complimentary Author PDF: Not for Broad Dissemination

ASHA American Speech-Language-Hearing Association

JSLHR

Review Article

Capitalizing on Digital Health Care for Speech-Language Pathology and Audiology Professions to Be Contextually Relevant, Responsive, and Responsible in South Africa: A Narrative Review

Katijah Khoza-Shangase[a]

[a] University of the Witwatersrand, Johannesburg, South Africa

ARTICLE INFO

Article History:
Received December 18, 2024
Revision received March 12, 2025
Accepted June 13, 2025

Editor-in-Chief: Rachael Frush Holt
Editor: Elizabeth Walker

https://doi.org/10.1044/2025_JSLHR-24-00895

ABSTRACT

Background: The integration of digital health care technologies into speech-language pathology and audiology is rapidly transforming service delivery. In South Africa and other low- and middle-income countries (LMICs), digital tools offer significant opportunities to address access challenges and enhance patient outcomes. However, the adoption of these technologies requires careful consideration of contextual factors.
Objective: This study is a narrative review that analyzes the role of digital health care in speech-language pathology and audiology within the South African and LMIC context.
Method: A narrative review of 64 studies was conducted, extracting and synthesizing data into key thematic areas. The synthesis focused on the impact of digital health care on service delivery, training and capacity building, ethical challenges, and policy implications.
Results: The results highlight opportunities and challenges associated with digital health care implementation in speech-language pathology and audiology. Findings reveal five major themes in line with study objectives: (a) Digital health care enhances accessibility and equity in speech-language pathology and audiology services, particularly through telehealth and mobile applications; (b) artificial intelligence–driven diagnostics and personalized interventions improve efficiency and patient outcomes; (c) barriers include infrastructure deficits, regulatory gaps, and digital literacy challenges; (d) ethical and cultural considerations must be addressed to ensure inclusivity and equitable care; and (e) professional training and continuous professional development are critical for equipping practitioners with the necessary skills to integrate digital tools into clinical practice effectively.
Conclusions: Digital health care presents a transformative opportunity for speech-language pathology and audiology, but its success in South Africa and LMICs depends on targeted investments, policy alignment, and culturally responsive implementation. Key recommendations include expanding digital infrastructure, integrating digital health care training into academic curricula, establishing regulatory and ethical guidelines, and promoting research on the contextual adaptation of digital tools. By embracing these strategies, speech-language pathology and audiology professions can enhance service delivery; improve patient outcomes; and ensure digital health care is contextually relevant, responsive, and responsible.
Supplemental Material: https://doi.org/10.23641/asha.29997847

Correspondence to Katijah Khoza-Shangase: Katijah.Khoza-Shangase@wits.ac.za. ***Disclosure:*** *The author has declared that no competing financial or nonfinancial interests existed at the time of publication.*

 • Copyright © 2025 American Speech-Language-Hearing Association

Complimentary Author PDF: Not for Broad Dissemination

Hearing loss and communication disorders are significant global health issues, affecting millions of individuals across all age groups. According to the World Health Organization, over 466 million people worldwide suffer from disabling hearing loss, with this number expected to rise to more than 900 million by 2050 (Olusanya et al., 2020). In Sub-Saharan Africa alone, 10% of the population—approximately 49.66 million people—experience hearing loss, making it the region with the third-highest prevalence globally (Olusanya et al., 2020). In South Africa, this challenge is further compounded by disparities in access to health care, with many individuals, particularly those in rural and underserved areas, unable to receive timely audiology and speech-language pathology services (Khoza-Shangase, 2022b).

Addressing hearing loss and communication disorders in this context requires innovative solutions, particularly through the integration of digital health care technologies to improve accessibility and service delivery (Khoza-Shangase et al., 2021; Lüdtke, 2023; Mothemela et al., 2025; Swanepoel, 2023). South Africa's health care system grapples with significant challenges, including disparities in access to services, limited resources, diverse cultural and linguistic populations, and a lack of awareness about communication disorders and hearing health (S. Govender et al., 2022; Khoza-Shangase, 2021; Khoza-Shangase & Mophosho, 2021; Moonsamy et al., 2017; Mophosho, 2018; Pillay et al., 2020). Kanji and Khoza-Shangase (2021), Hudson and DeRuiter (2023), and Smiley and Murphy (2024) argue that there is a pressing need for speech-language pathologists (SLPs) and audiologists to adapt their practices to meet the demands of a changing health care landscape. The COVID-19 pandemic has further highlighted the limitations of traditional service delivery methods and has accelerated the adoption of telehealth and digital tools within the health care sector (Golinelli et al., 2020; Khoshrounejad et al., 2021; Khoza-Shangase, Moroe, Neille, & Edwards, 2022; Khoza-Shangase, Moroe, & Sebothoma, 2022), with a clear need for the South African professions to carefully and deliberately plan for the present and foreseeable future.

The next few years will be crucial for shaping the trajectory of speech-language pathology and audiology in South Africa. Digital health care—broadly defined as the use of technology to enhance health care delivery, access, and outcomes—includes a range of digital tools that are increasingly recognized for their potential to enhance service delivery in speech-language pathology and audiology, particularly by improving access to care in underserved and rural communities. These tools encompass telehealth platforms, artificial intelligence (AI)–assisted diagnostics, mobile health (mHealth) applications, wearable hearing and speech-monitoring devices, electronic health records (EHRs), and digital training simulations for health care professionals. Digital health care is at the forefront of transforming how care is delivered, managed, and accessed (Bhamjee et al., 2022; S. Govender et al., 2022; Khoza-Shangase et al., 2021; Swanepoel et al., 2019; Wasmann et al., 2021). Given South Africa's unique health care challenges, it is imperative that the speech-language pathology and audiology professions understand, adopt, and integrate these digital solutions to enhance service delivery, improve patient outcomes, and ensure that their practices remain relevant to the communities they serve. With rapid advancements in digital health care, practitioners have unprecedented opportunities to enhance service delivery, improve patient outcomes, and ensure that their practices remain relevant to the communities they serve, particularly if the professions are to leverage the lessons and opportunities presented by the COVID-19 pandemic to shape future practice models.

In audiology, the assessment and management of hearing loss in South Africa are fraught with complexities and challenges across various domains, including early hearing detection and intervention (EHDI; Casoojee & Khoza-Shangase, 2022; Khoza-Shangase, 2022a; Maluleke et al., 2024; Naidoo & Khan, 2022), occupational noise–induced hearing loss (ONIHL; Manning & Pillay, 2020; Moroe & Khoza-Shangase, 2022; Ntlhakana, 2022; Tsoumbou, 2018), ototoxicity (Khoza-Shangase, 2022a; Paken et al., 2016, 2019; Pillay, 2020), and middle ear pathologies (Joubert, 2022; Sebothoma & Khoza-Shangase, 2022). In EHDI, delayed diagnosis due to limited access to newborn screening and intervention programs remains a critical issue, particularly in the public health care sector and rural and resource-constrained areas (Louw et al., 2024; Naidoo & Khan, 2022; Petrocchi-Bartal et al., 2021). ONIHL, a significant concern in industries such as mining, is exacerbated by inadequate hearing conservation programs and the lack of consistent monitoring and early intervention protocols (Chendume, 2021; Moroe et al., 2018; Ntlhakana et al., 2020). Ototoxicity, where medications such as aminoglycosides and tuberculosis treatments can cause hearing damage, presents challenges in terms of insufficient monitoring and a lack of awareness among health care providers and patients (Khoza-Shangase & Masondo, 2020; Moodley et al., 2021; Paken et al., 2020). Similarly, middle ear pathologies, such as infections, are often underdiagnosed and undertreated due to fragmented health care systems—characterized by a lack of coordination between primary, secondary, and tertiary care; inconsistent referral pathways; and disparities in access to specialized audiological services—and limited diagnostic capacity at the primary care level (Mabasa, 2023; Phanguphangu, 2017; Sebothoma, 2020; Sebothoma & Baloyi, 2024; Sebothoma & Khoza-Shangase, 2022, 2023).

Complimentary Author PDF: Not for Broad Dissemination

In speech-language pathology, digital health care also has the potential to transform the assessment and treatment of speech, language, and communication disorders. Many South Africans face barriers to accessing speech-language pathology services due to geographic, financial, and systemic constraints (Khoza-Shangase & Mophosho, 2021). The inadequate early identification and intervention for speech and language disorders remains a significant issue due to the lack of screening programs, shortage of trained professionals, and sociocultural factors that may delay help-seeking behavior (Moonsamy et al., 2017; Petrocchi-Bartal et al., 2021). Additionally, neurogenic communication disorders such as aphasia and dysphagia require ongoing therapy that is often disrupted by logistical and accessibility challenges (Kljajevic, 2024; Repetto et al., 2021; Stark & Warburton, 2018).

Digital health care offers transformative solutions by enabling remote screening, diagnosis, real-time monitoring, and telehealth interventions in both audiology and speech-language pathology. For example, mHealth applications can facilitate early hearing screenings in newborns (Madzivhandila et al., 2024; Ramkumar et al., 2018; Swanepoel et al., 2019) and those with early communication delays, while remote monitoring tools and wearable technology can track occupational noise exposure and the effects of ototoxic medications (Madahana et al., 2024; Orikpete et al., 2024; Robler et al., 2022). Furthermore, tele-audiology platforms can provide timely access to specialist care for the management of middle ear conditions, ensuring that even patients in remote areas receive appropriate and timely interventions, especially within the South African context where capacity versus demand challenges are well documented and where the concentration of SLPs and audiologists is mainly in provinces such as Gauteng, Western Cape, and KwaZulu-Natal, with the other provinces underrepresented (Hlayisi, 2020, 2022; Joubert, 2022; Khoza-Shangase & Sebothoma, 2022; Pillay et al., 2020). In speech-language pathology, mobile therapy apps and AI-driven speech assessments enable remote management of fluency disorders, aphasia rehabilitation, and voice therapy (Ahmed et al., 2018; Barnett, 2024; Beccaluva et al., 2024; Du et al., 2023). Additionally, neurogenic communication disorders such as aphasia and dysarthria require ongoing therapy that is often disrupted by logistical and accessibility challenges in the public health care system (Kljajevic, 2024; Repetto et al., 2021; Stark & Warburton, 2018).

This narrative review explores how digital innovations can offer contextually relevant, responsive, and responsible solutions to challenges in both audiology and speech-language pathology. This review therefore aims to balance this discourse by examining the role of technology in both disciplines. By identifying the barriers, facilitators, and future directions for digital health care in South African audiology and speech-language pathology, this review highlights key strategies for advancing the professions in the coming years.

Method

Study Design

This study employs a narrative review approach to synthesize existing literature on the integration of digital health care technologies in speech-language pathology and audiology within the South African context. Unlike systematic reviews, which follow a rigid methodological framework for data selection and analysis, a narrative review allows for a broader exploration of themes, trends, and emerging issues (Popay et al., 2006). This review aims to provide a contextualized discussion of digital health care advancements as well as their relevance, challenges, and opportunities in speech-language pathology and audiology practice in South Africa. The selection of a narrative review was motivated by the need to integrate knowledge from diverse sources to generate a comprehensive and critical perspective on this evolving area of practice.

Literature Search Strategy

The literature search was conducted across multiple electronic databases, including PubMed, Scopus, Google Scholar, and institutional repositories. In addition, reference lists of key articles were manually searched to identify relevant sources. The search strategy focused on studies published between 2010 and 2024, ensuring that only recent and relevant literature was included. The following key words and Boolean operators were used in various combinations:

- "Digital healthcare" AND "speech-language pathology" AND "South Africa"
- "Telehealth" OR "telepractice" AND "audiology" AND "Africa"
- "Artificial intelligence in audiology" OR "machine learning in speech therapy"
- "Ethical considerations" AND "digital health" AND "communication disorders"

To ensure a comprehensive overview, a combination of peer-reviewed journal articles, policy documents, gray literature, and conference proceedings was reviewed. The inclusion and exclusion criteria were applied as follows:

Complimentary Author PDF: Not for Broad Dissemination

- Inclusion criteria:
  - Studies discussing digital health care applications in speech-language pathology and audiology
  - Research from any geographic location but mostly papers focusing on South African or similar LMIC contexts
  - Articles published in English
  - Papers covering themes of telehealth, AI, mHealth, wearable health technology, and digital training initiatives in communication disorders
- Exclusion criteria:
  - Studies unrelated to digital health care in communication sciences
  - Literature focused solely on other medical specializations (e.g., telemedicine in general health care without speech-language pathology or audiology relevance)
  - Non-English publications unless widely cited or relevant to the discussion

Data Extraction and Synthesis

A thematic analysis approach was employed to synthesize findings from the selected literature (Braun & Clarke, 2006). Articles were reviewed using five predefined themes, aligned with the study objectives:

1. *Barriers and facilitators* to digital health care implementation in speech-language pathology and audiology
2. *Technological innovations* relevant to South African health care settings
3. *Professional training and development* in digital health care
4. *Ethical and contextual considerations* related to digital health adoption
5. *Future directions and policy implications* for the professions

These themes guided the organization of the Results section. Within each theme, subthemes were identified through pattern recognition across the studies. The extracted data were categorized and analyzed to identify patterns, trends, and areas for further exploration. Studies were critically appraised for their relevance, rigor, and applicability within the South African health care landscape. This appraisal was guided by a structured evaluation of each study's aims, methodology, sample characteristics, context, and the clarity and credibility of findings. Studies that demonstrated methodological soundness and offered insights applicable to South African or similar LMIC contexts were prioritized. The quality appraisal informed the weight given to each study during the synthesis but was not used to exclude studies, as is consistent with narrative review methodology. Subthemes were not predetermined but were developed inductively through iterative reading of the included studies. Recurring concepts were grouped into overarching subthemes and refined via constant comparison, ensuring alignment with the research objectives.

While data saturation is not applicable in narrative reviews, the breadth of literature reviewed allowed for robust identification of dominant patterns and knowledge gaps (Sukhera, 2022). To enhance the reliability of the synthesis, two independent reviewers conducted the thematic analysis. Each reviewer independently coded the selected articles according to the emerging themes. Interrater reliability was established through comparison and discussion of codes, with discrepancies resolved through consensus. This collaborative approach ensured that the identified themes were not solely dependent on one reviewer's interpretation, thereby increasing the trustworthiness and consistency of the findings.

Quality Assurance and Interpretation

While narrative reviews offer flexibility, rigorous methodological safeguards were implemented to ensure reliability and transparency (Johnson et al., 2020). These included (a) systematic documentation of the search strategy and study selection process; (b) iterative refinement of the research questions in response to insights from the literature; (c) critical appraisal of included studies for methodological rigor (e.g., design type, sample size, relevance to digital health care in speech-language pathology and audiology), as reflected in the supplemental evidence table; and (d) engagement of multiple reviewers in theme development to enhance credibility and reduce individual bias. Although the initial search strategy included policy documents, gray literature, and conference proceedings, only peer-reviewed and published literature was ultimately included to ensure academic quality. To ensure diverse perspectives were captured, the review included studies from a range of countries, contexts (including LMICs), and methodologies (quantitative, qualitative, and mixed methods). An objective selection process was maintained using predefined inclusion and exclusion criteria that emphasized relevance, rigor, and applicability to the South African and broader LMIC context.

Ethical Considerations

As this study is based solely on a review of existing literature, formal ethical approval was not required.

Complimentary Author PDF: Not for Broad Dissemination

However, ethical research principles were upheld throughout the review process. All sources were appropriately cited to ensure academic integrity and to acknowledge the contributions of original authors. Only publicly available research was included to maintain credibility and reliability. To minimize bias, an objective approach was used in selecting and analyzing studies, ensuring that diverse perspectives were incorporated. To ensure diverse perspectives were incorporated, the review included studies across multiple geographical contexts, methodological designs, and technological domains. Objectivity was maintained through predefined inclusion criteria, multi-reviewer coding of themes, and the systematic documentation of study characteristics such as geographic focus and scientific rigor. Potential conflicts of interest were considered, and limitations within the available data were acknowledged to promote transparency. Additionally, by including a wide range of studies, efforts were made to reflect the breadth of existing knowledge while identifying gaps in research and highlighting areas that require further investigation. This ethical approach ensured that the review was conducted with academic rigor and integrity, reinforcing its credibility as a contribution to the discourse on digital health care advancements in audiology and speech-language pathology.

Results

Profile of the Studies Included

A total of 64 studies spanning 2016–2024 were reviewed, covering various aspects of digital health care applications in speech-language pathology and audiology. The included studies spanned multiple domains (see Table 1 and Supplemental Material S1), including telehealth implementation, AI applications, wearable health technologies, and ethical considerations in digital health care. The studies encompassed diverse methodologies, including systematic and scoping reviews (21), experimental studies (16), qualitative and mixed-methods studies (17), and narrative and theoretical reviews (10). The geographical focus of these studies varied, with a mix of international research and context-specific studies relevant to South Africa. Specifically, there were South Africa–focused studies (17), other African contexts (six), and global studies (including United States, United Kingdom, Europe, and Asia; 41). Table 1 concisely presents the distribution of studies across different thematic domains while providing key references for each category.

Thematic Findings

A thematic analysis approach was used to organize and synthesize findings across the 64 studies included. Five predefined themes guided the analysis, aligned with the study objectives: (a) barriers and facilitators to digital health care implementation, (b) technological innovations relevant to South African health care settings, (c) professional training and development in digital health care, (d) ethical and contextual considerations, and (e) future directions and policy implications for the professions. These themes were refined inductively during analysis to capture emergent insights and recurring patterns. Under each theme, a number of distinct subthemes were identified based on converging findings across multiple studies. These subthemes represent specific domains of interest (e.g., infrastructure challenges, telehealth tools, AI use in diagnostics, training gaps, and ethical risks). Table 2 presents the five overarching themes and the associated subthemes and key insights, illustrating the complexity and interrelatedness of factors affecting digital health care in speech-language pathology and audiology.

Theme 1: Barriers and Facilitators to Digital Health Care Implementation

As far as *barriers* were concerned, four key barriers emerged: first, *limited digital infrastructure*, where many studies highlighted challenges such as poor internet connectivity, lack of access to digital devices, and affordability issues, especially in rural areas (e.g., Govender et al., 2022; Khoza-Shangase & Sebothoma, 2022; Patel et al., 2022); second, *digital and health literacy challenges*, where studies (e.g., Khoza-Shangase & Mophosho, 2021; Naidoo & Khan, 2022; Swanepoel et al., 2019; Townsend et al.,

Table 1. Study characteristics by thematic domain.

Theme	No. of studies	Example references
1. Barriers and facilitators to digital health care	15	S. Govender et al. (2022); Khoza-Shangase et al. (2021); Naidoo & Khan (2022)
2. Technological innovations in speech-language pathology and audiology	21	Khalid et al. (2024); Madahana et al. (2024); Swanepoel et al. (2019)
3. Professional training and development	10	Alanazi et al. (2022); Khoza-Shangase et al. (2021); Nagdee et al. (2022)
4. Ethical and contextual considerations	9	Kouri et al. (2022); Möllmann et al. (2021); Townsend et al. (2020)
5. Future directions and policy implications	9	Brall et al. (2019); Swanepoel (2023); Wasmann et al. (2022)

Complimentary Author PDF: Not for Broad Dissemination

Table 2. Thematic findings with subthemes and key insights.

Theme	Subtheme and key insights
1. Barriers and facilitators to digital health care	Limited infrastructure, bandwidth, and access in rural areas (S. Govender et al., 2022)
	Facilitators include mobile network expansion and clinician adaptability
	Cultural and linguistic barriers limit tool relevance; lack of multilingual content hampers usability (Khoza-Shangase & Mophosho, 2021)
2. Technological innovations in speech-language pathology and audiology	AI-enhanced diagnostic tools improve accuracy and efficiency across hearing and speech assessments (Beccaluva et al., 2024; Khalid et al., 2024)
	mHealth and wearables allow for remote monitoring and early detection (Kinsey & Cherney, 2024; Patel et al., 2022)
3. Professional training and development	Simulation and virtual platforms improve clinical competency in digital service delivery (Alanazi & Nicholson, 2023)
	Gaps exist in digital health literacy among speech-language pathology/audiology students; training needed from undergraduate level (Nagdee et al., 2022)
4. Ethical and contextual considerations	POPIA compliance and patient privacy are key concerns in digital rollout (Townsend et al., 2020)
	Need for culturally sensitive AI and tools validated in South African contexts (Möllmann et al., 2021)
5. Future directions and policy implications	PPPs critical for scaling up digital infrastructure (Ebulue et al., 2024)
	Further research required to assess local tool efficacy and equity (Swanepoel, 2023; Wasmann et al., 2022)

Note. AI = artificial intelligence; mHealth = mobile health; POPIA = Protection of Personal Information Act; PPPs = public-private partnership.

2020) reported low digital health literacy among both health care professionals and patients as a recurrent barrier; third, *regulatory, policy, and ethical concerns*, where several studies (e.g., Bhamjee et al., 2022; Townsend et al., 2020) noted unclear telehealth policies in South Africa (data security, patient confidentiality, and compliance with regulations such as South Africa's Protection of Personal Information Act [POPIA] were key concerns [Möllmann et al., 2021; Townsend et al., 2020]); and fourth, *cultural and linguistic challenges*, where studies (e.g., Khoza-Shangase & Mophosho, 2021; Madahana et al., 2022) highlighted the lack of multilingual digital platforms, limiting equitable access. When it comes to *facilitators,* four key facilitators emerged. First, *public–private partnerships (PPPs)* were highlighted, with studies (e.g., Ebulue et al., 2024; Ganapathy & Reddy, 2021) emphasizing the role of telecommunication companies (MTN, Vodacom) in expanding affordable network access. Collaborations between government, universities, and telecommunication companies were identified as key facilitators for improving digital access (Ebulue et al., 2024; Ganapathy & Reddy, 2021). Second, *growing adoption of telehealth post–COVID-19* was found, where studies (e.g., D'Onofrio & Zeng, 2022; Golinelli et al., 2020; Khoza-Shangase, Moroe, & Sebothoma, 2022) reported that COVID-19 accelerated digital health adoption, normalizing telehealth, with the pandemic significantly boosting the acceptance of digital health care services (Golinelli et al., 2020; Khoza-Shangase, Moroe, & Sebothoma, 2022). Third, *government initiatives* were underscored, where some studies (e.g., Peerbhay et al., 2024) identified South African health sector reforms supporting digital health integration. Fourth, *mHealth solutions* emerged as a facilitator, with apps for hearing screening and speech therapy being identified as promising tools for expanding access (e.g., Madzivhandila et al., 2024; Swanepoel et al., 2019).

Theme 2: Technological Innovations Relevant to South African Health Care

First, *tele-audiology applications* emerged as an important finding for technological innovations relevant to South African health care. Studies (e.g., Lin & Chen, 2024; Platia, 2021; Tao, 2020) reported that remote hearing aid fittings and mobile audiometry are improving access in LMICs and also demonstrated the feasibility of remote hearing assessments and follow-ups using tele-audiology. Second, *AI applications/AI-driven diagnostics* was another important finding. Studies (e.g., Almutairi, 2024; Wasmann et al., 2022) described AI-driven automated speech assessments and machine learning for hearing diagnostics. AI applications were found to enhance hearing and speech disorder diagnoses through automated data analysis (Beccaluva et al., 2024; Khalid et al., 2024). Third, *wearables for continuous monitoring and mHealth technologies* were underscored. Studies (e.g., Johansen et al., 2017; Kinsey & Cherney, 2024) explored real-time voice monitoring and AI-driven hearing aid personalization. Real-time tracking of auditory exposure and vocal strain was identified as a growing area of innovation (Kinsey & Cherney, 2024; Llorente et al., 2024). Fourth, *simulation-based education* was highlighted as another technological innovation relevant to speech-language pathology and audiology. Studies (e.g., Alanazi & Nicholson, 2023; Nagdee et al., 2022) reported that

Complimentary Author PDF: Not for Broad Dissemination

virtual patient simulations enhance audiology and speech-language pathology training.

Theme 3: Professional Training and Development in Digital Health Care

There were three key findings when it came to professional training and development in digital health care. First, *integration of digital tools in training* was highlighted. Studies (e.g., Alanazi et al., 2022; Lin et al., 2021) emphasized that digital training modules are critical for future speech-language pathology and audiology professionals. The need for digital tool training in audiology and speech-language pathology curricula was emphasized (Alanazi et al., 2022; Alanazi & Nicholson, 2023). Second, *simulation-based learning* was found as important for professional training. Studies (e.g., Alanazi & Nicholson, 2023; Marshall et al., 2016) found that virtual reality– and simulation-based training were found to enhance clinical skills and improve clinical confidence in digital health care (Lee, 2019; Nagdee et al., 2022). Third, *continuous professional development (CPD) needs* were underscored by several studies. Studies (e.g., Nagdee et al., 2022; Townsend et al., 2020) indicated that CPD programs in South Africa lack structured digital health training. Ongoing CPD courses on telehealth, AI, and digital diagnostics were identified as critical for professional upskilling (Townsend et al., 2020).

Theme 4: Ethical and Contextual Considerations

Several studies highlighted three important ethical and contextual considerations toward digital health care. First, *privacy and data security concerns* were raised. Studies (e.g., Möllmann et al., 2021; Nebeker et al., 2020) reported that telehealth platforms must comply with South Africa's POPIA laws. The need for secure data storage and encryption was highlighted (Möllmann et al., 2021; Spinardi-Panes et al., 2013). Second, *algorithmic bias in AI* (*linguistic and cultural considerations*) was an important consideration underscored. Studies (e.g., Khalid et al., 2024; Sadegh-Zadeh et al., 2024) warned of bias in AI-based audiology and speech tools, requiring culturally sensitive AI models. Tools must be validated for South African languages to ensure contextual relevance (Khoza-Shangase & Mophosho, 2021; Madahana et al., 2022). Third, *digital divide implications* were raised. Studies (e.g., Govender et al., 2022; Hlayisi, 2022) emphasized the risk of deepening health inequities if digital health care remains inaccessible in low-income areas. Strategies to bridge the digital divide and ensuring equitable access, such as subsidized internet access, were deemed essential (Patel et al., 2022; Reddy et al., 2022).

Theme 5: Future Directions and Policy Implications

A number of studies advanced future directions and policy implications. First, *digital infrastructure investment* was raised as a key strategy. Studies (e.g., Bhamjee et al., 2022; Ebulue et al., 2024) recommended government funding for rural broadband expansion. Improved internet connectivity and affordable mHealth solutions were recommended (Ebulue et al., 2024; Joudyian et al., 2021). Second, *standardization of telehealth policies and policy alignment with digital health care growth* was strongly recommended. Studies (e.g., Khoza-Shangase & Sebothoma, 2022; Townsend et al., 2020) called for clear national telehealth regulations. Ensuring that telehealth regulations align with technological advancements was highlighted as a key priority (Townsend et al., 2020). Third, *AI validation in South Africa* was highlighted. Studies (e.g., Beccaluva et al., 2024; Khoza-Shangase, Moroe, & Sebothoma, 2022; Wasmann et al., 2022) emphasized the need for AI tool validation with African data sets that comprise diverse population. Last, *interdisciplinary collaboration* was underscored as an important future direction. Studies (e.g., Nagdee et al., 2022; Patel et al., 2022; Suh et al., 2024) highlighted the importance of collaborations between health care professionals, engineers, and policymakers to optimize digital solutions.

Discussion

Profile of the Studies Included

The studies reviewed in this narrative synthesis covered a broad range of digital health care applications in speech-language pathology and audiology, reflecting the increasing integration of technology in these fields. The majority of studies were published within the last 5 years, highlighting the recent surge in research on telehealth, AI, wearable technology, and mHealth applications. A significant proportion of the studies focused on the effectiveness and feasibility of digital interventions, including teleaudiology, digital speech therapy tools, and AI-driven diagnostic platforms. Several studies were conducted in high-income countries, primarily in North America and Europe, where digital health infrastructure is more advanced. However, an increasing number of studies focused on LMICs, particularly South Africa, where the implementation of digital health care is crucial for addressing disparities in access to care. Studies examining telehealth solutions, mobile applications, and AI in health care delivery were particularly relevant in the African context, as they provided insights into how technology can bridge gaps in service provision.

Transformative Benefits of Digital Health Care

Remote Access to Services

Telehealth and mHealth applications have significantly improved accessibility to speech-language pathology

Complimentary Author PDF: Not for Broad Dissemination

and audiology services, particularly in regions where professionals are scarce. Numerous studies have demonstrated that telehealth can reduce barriers to access for individuals with communication disorders, improving both the quality and timeliness of care (Govender et al., 2022; Madahana et al., 2024; Madzivhandila et al., 2024; Orikpete et al., 2024; Ramkumar et al., 2018; Robler et al., 2022; Swanepoel et al., 2019). mHealth apps also empower patients through tools for self-assessment and condition management (Madzivhandila et al., 2024; Ramkumar et al., 2018; Swanepoel et al., 2019). Several studies demonstrated the utility of tele-audiology in EHDI, remote hearing aid programming, and auditory rehabilitation (Angral et al., 2022; D'Onofrio & Zeng, 2022; Lin & Chen, 2024; Platia, 2021). This democratization of health care resources is essential in a country, such as South Africa, where socioeconomic factors often dictate the quality of care received. For African nations, where geographic and economic barriers hinder health care access, the adoption of telehealth is crucial.

Enhanced Diagnostics and Personalized Interventions

AI-driven diagnostic tools offer automation and speed in diagnosing hearing, language, and speech disorders (Davis & Pagliuco, 2022; Essaid et al., 2024; Lee, 2019; Mahmood et al., 2024; Mallipeddi et al., 2023; Marshall et al., 2016; McKearney, 2023; Sadegh-Zadeh et al., 2024). These technologies assist in identifying auditory processing disorders (Milne, 2021; Vendruscolo et al., 2023), dysphonia (Almutairi, 2024; Wilson, 2024), and developmental language disorders (Beccaluva et al., 2024; Gopi et al., 2024; Reinhart et al., 2024). This use demonstrates the potential of machine learning in clinical decision making. However, algorithmic bias remains a concern in multilingual and multicultural contexts (Khalid et al., 2024; Sadegh-Zadeh et al., 2024).

Continuous Monitoring and Data Collection

Wearables and mobile applications facilitate real-time tracking of hearing, voice use, and noise exposure (Kinsey & Cherney, 2024; Madahana et al., 2024; Orikpete et al., 2024; Robler et al., 2022; Tao, 2020; Wasmann et al., 2022). These tools facilitate early detection of ONIHL, ototoxicity, and tracking of voice disorders. When it comes to data collection, digital tools in both speech-language pathology and audiology facilitate the collection of vast amounts of data, which can be analyzed to improve clinical decision making and research outcomes (Dinh-Le et al., 2019; Johansen et al., 2017; Khoza-Shangase, Moroe, & Sebothoma, 2022; Lin et al., 2021; Ne et al., 2021; Robler et al., 2022; Wasmann et al., 2021). These tools allow clinicians to track patient progress in real time, make data-driven adjustments to treatment plans, and contribute to the growing body of research that advances the understanding of communication and auditory disorders (Beccaluva et al., 2024; Gopi et al., 2024; Kollmeier & Kiessling, 2018; Nielsen et al., 2018; Reinhart et al., 2024). The insights gained from large-scale data analysis not only enhance individual patient care but also help to shape evidence-based practices and inform the development of new therapeutic strategies (Ahmed et al., 2018; Barnett, 2024; Chandra et al., 2022; Chaudhary et al., 2022; Du et al., 2023; Geffner, 2024; Madahana et al., 2024; McNaney et al., 2018; Mitra et al., 2023; Orikpete et al., 2024; Patel et al., 2022; Robler et al., 2022; Schuler, 2019). Such research, within the linguistically and culturally diverse South African context, should include research on the very use of these digital tools in this context to ensure that it is evidence based.

Challenges in Implementation and Equity

Infrastructure and Resource Constraints

Widespread adoption of digital health care is hindered by infrastructural deficiencies, especially in rural LMIC settings. Digital health care presents an opportunity to mitigate health care disparities in LMICs by extending services to marginalized populations. PPPs that can facilitate investments in digital infrastructure, making these interventions more sustainable in resource-limited settings, are often lacking, thus creating a challenge for speech-language pathology and audiology to capitalize on these innovations (Ebulue et al., 2024; Ganapathy & Reddy, 2021; Joudyian et al., 2021). Additionally, reliable internet access, devices, and technical support are often lacking (Govender et al., 2022).

Digital Literacy and Inclusivity

Low digital and health literacy among clinicians and patients poses a significant barrier. Despite the advantages of digital health care, the digital divide remains a significant challenge in many African contexts (Govender et al., 2022). Variations in internet access, digital and health literacy, and affordability of digital tools limit the effectiveness of telehealth interventions. The implementation of strategies to overcome this divide, such as including subsidizing access to digital services, integrating mHealth technologies that function on low-bandwidth networks, and enhancing digital literacy among both health care professionals and patients, is yet to be seen (Patel et al., 2022; Reddy et al., 2022). Moreover, language diversity further complicates user navigation of English-dominant digital tools (Reddy et al., 2022). The linguistic diversity of South Africa and other African nations requires digital health care tools to be adapted for multilingual users (Khoza-Shangase & Mophosho, 2021). Studies highlight the importance of culturally sensitive digital platforms that provide

Complimentary Author PDF: Not for Broad Dissemination

instructions, assessments, and interventions in multiple languages. Furthermore, digital tools must align with culturally appropriate health care–seeking behaviors to ensure community buy-in and engagement (Govender & Khan, 2017; Khoza-Shangase & Mophosho, 2021; Madahana et al., 2022; Mtimkulu & Khoza-Shangase, 2024; Pillay et al., 2020).

Data Privacy and Security

With increased digitization comes heightened risks for data breaches. Issues related to data security, privacy regulations, and ethical considerations must be carefully managed to ensure compliance with frameworks such as South Africa's POPIA and National Health Act (Möllmann et al., 2021; Townsend et al., 2020).

Ethical Use of AI

The risk of algorithmic bias and the lack of transparency in AI systems require ethical oversight. For responsible and ethical implementation of digital health care by speech-language pathology and audiology professions, (a) data privacy and security, (b) ethical use of AI in clinical decision making, and (c) avoiding the digital divide are crucial considerations (Brall et al., 2019; Kouri et al., 2022; Möllmann et al., 2021; Nebeker et al., 2020; Spinardi-Panes et al., 2013). Over and above the need for stringent data privacy and security measures to protect patient information (Townsend et al., 2020), there must be robust protocols to prevent unauthorized access to EHRs and personal health information (Dinh-Le et al., 2019). Next, while AI has shown promise in enhancing diagnostic accuracy and treatment personalization, concerns about algorithmic bias and ethical oversight remain critical (Khoza-Shangase & Mophosho, 2021; Madahana et al., 2022). Human oversight should be maintained in AI-driven decision making to uphold ethical standards in patient care, thus ensuring ethical use of AI in clinical decision making. Last, to ensure that digital health care in speech-language pathology and audiology benefits all populations, concerted efforts must be made to improve accessibility. Policies that promote affordable internet access, government incentives for digital health adoption, and local innovations tailored to LMIC settings can play a significant role in reducing digital inequalities, thus *avoiding the digital divide*.

Contextual Relevance to South Africa and Other LMICs

Digital health care offers immense potential to reduce inequities in South Africa and other similar LMICs, characterized by fragmented health care systems, rural service gaps, and cultural and language diversity. While the benefits of telehealth, AI, and wearable technologies are evident, the successful implementation of these solutions requires a multifaceted approach. Investment in digital infrastructure, cross-sector collaborations, culturally relevant digital interventions, and regulatory frameworks that protect patient data are all essential. Furthermore, ongoing research is needed to validate digital health care tools in diverse populations, ensuring their effectiveness and equity in different linguistic and cultural settings. By addressing these key factors, African nations and other LMICs can leverage digital health care innovations to enhance accessibility, improve patient outcomes, and build resilient health care systems that can withstand future challenges. PPPs (Ebulue et al., 2024; Ganapathy & Reddy, 2021; Joudyian et al., 2021) and multilingual, culturally competent platforms (Khoza-Shangase & Mophosho, 2021; Madahana et al., 2022) are critical. Training, affordability, and infrastructure investment are essential for sustainability.

Training and Professional Development in Digital Health Care

The integration of digital health care into speech-language pathology and audiology training programs is critical to equipping future professionals with the necessary competencies (Alanazi et al., 2022; Alanazi & Nicholson, 2023; Nagdee et al., 2022). The review emphasized the importance of incorporating digital tools into undergraduate curricula, ensuring hands-on experience with telehealth, AI-based assessments, and digital therapy applications. Additionally, ongoing CPD programs must be designed to keep practitioners up-to-date with evolving digital health care trends (Brall et al., 2019; Kouri et al., 2022; Möllmann et al., 2021; Nebeker et al., 2020; Spinardi-Panes et al., 2013). The Health Professions Council of South Africa accreditation standards should be revised to reflect these technological advancements, ensuring that digital competencies are an essential component of professional training (Townsend et al., 2020). In South Africa, where the digital divide poses significant challenges, practitioners must be trained to ensure that digital health care tools are used in a way that is inclusive and accessible to all patients, regardless of their socioeconomic status or geographic location (Reddy et al., 2022).

This review has some inherent limitations. First, as a narrative review, it does not follow the structured methodology of systematic reviews, meaning that publication bias or selection bias may be present. The lack of formal meta-analysis limits the ability to draw quantitative conclusions. Second, the reliance on English language publications may exclude valuable insights from non-English sources. Third, while every effort was made to ensure a comprehensive overview, not all digital health care applications in speech-language pathology and audiology may have been captured due to the rapidly evolving nature of

Complimentary Author PDF: Not for Broad Dissemination

the field. A notable limitation of this review is the lack of in-depth discussion on the integration of digital health care technologies in dysphagia assessment and management within speech-language pathology. Dysphagia remains a critical area of clinical practice, and emerging digital tools such as telehealth for remote swallowing assessments, AI-driven diagnostics, and wearable biosensors for real-time monitoring hold significant potential for improving care. Future research should explore how these technologies can be effectively implemented in resource-limited settings such as South Africa, ensuring accessibility, cultural relevance, and clinical efficacy. Investigating the feasibility, benefits, and challenges of digital dysphagia interventions would provide valuable insights into expanding the role of digital health care in speech-language pathology beyond the domains covered in this review. Despite these limitations, this review provides a critical synthesis of current knowledge and offers a foundation for further research and policy development in digital health care for communication disorders in South Africa.

Conclusions and Actionable Recommendations

Projections indicate that the global telehealth market will grow significantly, with its value expected to increase from $38.7 billion in 2020 to $191.7 billion by 2025 (ReportLinker, 2020). The implications for Africa are significant, as telehealth can extend services to remote areas, ensuring that individuals in rural and underserved communities receive timely care. However, the success of these interventions depends on adequate infrastructure, including stable internet connectivity and access to affordable digital devices. This transformative period will see the evolution of telehealth, the increased use of AI and machine learning in diagnostics, and the expansion of wearable health technology. These emerging trends will drive a shift toward tech-driven care, where virtual services and patient self-management become more prominent. Digital health care presents a transformative opportunity for speech-language pathology and audiology in South African and similar LMIC contexts. The integration of AI, telehealth, wearable devices, and data analytics—as highlighted in the findings—can enhance service delivery, improve access, and tailor interventions to meet diverse patient needs. However, these advancements must be contextually adapted to address infrastructure challenges, cultural and linguistic diversity, and workforce training gaps. To prepare for the challenges that come with digital health care, including cybersecurity threats, regulatory compliance, and ethical considerations, speech-language pathology and audiology professionals must remain proactive and vigilant in adapting to these changes. By embracing these technologies, professionals can enhance access to care; improve patient outcomes; and ensure that their practices remain contextually relevant, responsive, and responsible.

To ensure successful and equitable implementation, this review proposes the following actionable recommendations:

1. *Investment in infrastructure*: Governments and stakeholders should prioritize expanding digital infrastructure, particularly in rural and underserved areas, to ensure equitable access to telehealth and digital tools. Investments in digital infrastructure include investing in improving internet connectivity especially in rural areas and ensuring access to digital devices for both practitioners and patients through PPPs to support reliable and scalable service delivery.
2. *Curriculum and professional training*: Speech-language pathology and audiology programs must integrate telehealth, AI-powered diagnostics, and mHealth applications into undergraduate and continuing professional development programs. Training should emphasize digital literacy, ethical use, and culturally responsive care.
3. *Ethical and regulatory compliance*: Clear data governance frameworks that align with national policies such as POPIA and embedded ethical guidelines for AI use in clinical decision making must be established.
4. *Cultural and contextual validation*: Prioritize the development and validation of digital tools that are linguistically and culturally appropriate for South Africa's multilingual and diverse population, addressing a key gap identified in the review.
5. *PPPs*: Collaboration between health care professionals, policymakers, and technology developers can foster innovative and sustainable digital health care solutions. Fostering of collaboration is essential for creating and implementing contextually relevant digital solutions. By working together, stakeholders can ensure that technologies align with the unique needs of South African communities.
6. *Evidence-based implementation and evaluation*: Support for ongoing research is needed to evaluate the usability, effectiveness, and equity outcomes of digital interventions in speech-language pathology and audiology within the African context and other LMICs. Studies should focus on ensuring that the tools meet the specific needs of local populations.
7. *Ongoing digital transformation*: Rather than a fixed timeframe, the transition toward digitally enabled care must be continuous, with urgency for action now and sustained adaptation into the future to avoid obsolescence.

Complimentary Author PDF: Not for Broad Dissemination

By adopting these recommendations, the speech-language pathology and audiology professions can deliver contextually relevant, responsive, and responsible care, aligning their practices with the evolving digital health care landscape in South Africa and beyond.

Author Contributions

Katijah Khoza-Shangase: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing.

Data Availability Statement

Data used in this study are presented in the review article and supplemental material.

Acknowledgments

This research received no external funding. This article was presented at the Sefako Makgatho Health Sciences University's speech-language pathology and audiology program's anniversary celebrations on July 31, 2024, where the theme was "Speech-Language Pathology and Audiology: Shaping the Next 10 Years." The author would like to acknowledge the program for the invitation to engage with this forward-thinking topic and the attendees for critically engaging with the presentation, thus reshaping some of the arguments presented in this article.

References

Ahmed, B., Monroe, P., Hair, A., Tan, C. T., Gutierrez-Osuna, R., & Ballard, K. J. (2018). Speech-driven mobile games for speech therapy: User experiences and feasibility. *International Journal of Speech-Language Pathology, 20*(6), 644–658. https://doi.org/10.1080/17549507.2018.1513562

Alanazi, A. A., Mohamud, M. S., & AlSuwailem, S. S. (2022). The effect of simulation learning on audiology and speech-language pathology students' self-confidence related to early hearing detection and intervention: A randomized experiment. *Speech, Language and Hearing, 25*(2), 211–224. https://doi.org/10.1080/2050571X.2020.1846839

Alanazi, A. A., & Nicholson, N. (2023). The use of simulation in audiology education: A systematic review. *American Journal of Audiology, 32*(3), 640–656. https://doi.org/10.1044/2023_AJA-23-00054

Almutairi, M. (2024). Application of artificial intelligence in assessing speech, language, and voice disorders: A scoping review. *International Journal of Recent Research in Social Sciences and Humanities, 11*(1), 109–119. https://www.paperpublications.org/upload/book/Application%20of%20Artificial%20Intelligence-04032024-2.pdf [PDF]

Angral, S., Varshney, S., Aanand, P., & Raj, R. (2022). Tele otology in India: Last 10 years—A scopic review. *Indian Journal of Otolaryngology and Head & Neck Surgery, 74*(Suppl. 3), 3776–3788. https://doi.org/10.1007/s12070-021-02546-4

Barnett, R. G. (2024). *A qualitative evaluation of speech sound disorder treatment apps for children* [Master's thesis, San Jose State University]. ScholarWorks. https://doi.org/10.31979/etd.eu86-95sk

Beccaluva, E. A., Catania, F., Arosio, F., & Garzotto, F. (2024). Predicting developmental language disorders using artificial intelligence and a speech data analysis tool. *Human–Computer Interaction, 39*(1–2), 8–42. https://doi.org/10.1080/07370024.2023.2242837

Bhamjee, A., Le Roux, T., Swanepoel, D. W., Graham, M. A., Schlemmer, K., & Mahomed-Asmail, F. (2022). Perceptions of telehealth services for hearing loss in South Africa's public healthcare system. *International Journal of Environmental Research and Public Health, 19*(13), Article 7780. https://doi.org/10.3390/ijerph19137780

Brall, C., Schröder-Bäck, P., & Maeckelberghe, E. (2019). Ethical aspects of digital health from a justice point of view. *European Journal of Public Health, 29*(Suppl. 3), 18–22. https://doi.org/10.1093/eurpub/ckz167

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Casoojee, A., & Khoza-Shangase, K. (2022). Complexities and challenges with implementation of communication therapeutic approaches to early intervention in audiology in the African context. In K. Khoza-Shangase (Ed.), *Complexities and challenges in preventive audiology: An African perspective*. AOSIS Books. https://doi.org/10.4102/aosis.2022.BK311.03

Chandra, S., Gupta, G., Loucks, T., & Dautenhahn, K. (2022). Opportunities for social robots in the stuttering clinic: A review and proposed scenarios. *Paladyn, Journal of Behavioral Robotics, 13*(1), 23–44. https://doi.org/10.1515/pjbr-2022-0001

Chaudhary, C., John, S., Kumaran, D. S., Guddattu, V., & Krishnan, G. (2022). Technological interventions in stuttering: A systematic review. *Technology and Disability, 34*(4), 201–222. https://doi.org/10.3233/TAD-220379

Chendume, P. (2021). *An assessment of noise induced hearing loss of mine workers: A case study of an active mine in Rustenburg, South Africa* [Master's thesis, University of Johannesburg]. UJContent. https://hdl.handle.net/10210/496312

Davis, K. J., & Pagliuco, D. (2022). Telerehabilitation in speech-language pathology. In M. Alexander (Ed.), *Telerehabilitation: Principles and practice* (pp. 339–349). Elsevier. https://doi.org/10.1016/B978-0-323-82486-6.00023-X

Dinh-Le, C., Chuang, R., Chokshi, S., & Mann, D. (2019). Wearable health technology and electronic health record integration: Scoping review and future directions. *JMIR mHealth and uHealth, 7*(9), Article e12861. https://doi.org/10.2196/12861

D'Onofrio, K. L., & Zeng, F. G. (2022). Tele-audiology: Current state and future directions. *Frontiers in Digital Health, 3,* Article 788103. https://doi.org/10.3389/fdgth.2021.788103

Du, Y., Lubniewski, K., Price, L., Breslin, G., Thomson, P., Jinadasa, N., & Soni, N. (2023). "They can't believe they're a tiger": Insights from pediatric speech-language pathologist mobile app users and app designers. *International Journal of Language & Communication Disorders, 58*(5), 1717–1737. https://doi.org/10.1111/1460-6984.12898

Ebulue, C. C., Ebulue, O. R., & Ekesiobi, C. S. (2024). Public–private partnerships in health sector innovation: Lessons from around the world. *International Medical Science Research Journal, 4*(4), 484–499. https://doi.org/10.51594/imsrj.v4i4.1051

Complimentary Author PDF: Not for Broad Dissemination

Essaid, B., Kheddar, H., Batel, N., Chowdhury, M. E., & Lakas, A. (2024). Artificial intelligence for cochlear implants: Review of strategies, challenges, and perspectives. *IEEE Access, 12,* 119015–119038. https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10600677

Ganapathy, K., & Reddy, S. (2021). Technology enabled remote healthcare in public private partnership mode: A story from India. In R. Latifi, C. R. Doarn, & R. C. Merrell (Eds.), *Telemedicine, telehealth and telepresence: Principles, strategies, applications, and new directions* (pp. 197–233). Springer. https://doi.org/10.1007/978-3-030-56917-4_14

Geffner, D. (2024). Management strategies and sound enhancement. In D. Geffner & D. Ross-Swain (Eds.), *Auditory processing disorders: Assessment, management, and treatment* (4th ed., p. 373). Plural.

Golinelli, D., Boetto, E., Carullo, G., Nuzzolese, A. G., Landini, M. P., & Fantini, M. P. (2020). Adoption of digital technologies in health care during the COVID-19 pandemic: Systematic review of early scientific literature. *Journal of Medical Internet Research, 22*(11), Article e22280. https://doi.org/10.2196/22280

Gopi, V. P., Francis, B., & Thomas, A. (2024). Early-stage identification of autism in children using gesture monitoring based on artificial intelligence. In K. Pal, B. C. Neelapu, & J. Sivaraman (Eds.), *Advances in artificial intelligence: Biomedical engineering applications in signals and imaging* (pp. 491–522). The Academic Press. https://doi.org/10.1016/B978-0-443-19073-5.00018-5

Govender, S. M., & Khan, N. B. (2017). Knowledge and cultural beliefs of mothers regarding the risk factors of infant hearing loss and awareness of audiology services. *Journal of Public Health in Africa, 8*(1), Article a971. https://doi.org/10.4081/jphia.2017.557

Govender, S., Vallabhjee, A. L., Charles, C. R., Roesch, D., & Balton, S. (2022). Bridging the access gap: The telepractice experience of speech therapists and audiologists at a public health care facility in South Africa. *International Journal of Telerehabilitation, 14*(2), Article e6517. https://doi.org/10.5195/ijt.2022.6517

Hlayisi, V.-G. (2020). *Scarce health human resource wastage: No work for South African audiologists? A descriptive survey study*. Research Square. https://doi.org/10.21203/rs.2.24073/v1

Hlayisi, V.-G. (2022). Increasing unemployment rate amongst health professionals: Will there be jobs for newly graduated South African audiologists post-COVID-19? *South African Journal of Communication Disorders, 69*(2), Article a909. https://doi.org/10.4102/sajcd.v69i2.909

Hudson, M. W., & DeRuiter, M. (2023). *Professional issues in speech-language pathology and audiology* (6th ed.). Plural.

Johansen, B., Petersen, M. K., Korzepa, M. J., Larsen, J., Pontoppidan, N. H., & Larsen, J. E. (2017). Personalizing the fitting of hearing aids by learning contextual preferences from internet of things data. *Computers, 7*(1), Article 1. https://doi.org/10.3390/computers7010001

Johnson, J. L., Adkins, D., & Chauvin, S. (2020). A review of the quality indicators of rigor in qualitative research. *American Journal of Pharmaceutical Education, 84*(1), Article 7120. https://doi.org/10.5688/ajpe7120

Joubert, K. (2022). Community-based audiology services: An effective strategy for the prevention of hearing loss in rural communities. In K. Khoza-Shangase (Ed.), *Preventive audiology: An African perspective*. AOSIS Books. https://doi.org/10.4102/aosis.2022.BK209.04

Joudyian, N., Doshmangir, L., Mahdavi, M., Tabrizi, J. S., & Gordeev, V. S. (2021). Public–private partnerships in primary health care: A scoping review. *BMC Health Services Research, 21*(1), Article 4. https://doi.org/10.1186/s12913-020-05979-9

Kanji, A., & Khoza-Shangase, K. (2021). A paradigm shift in early hearing detection and intervention in South Africa. In K. Khoza-Shangase & A. Kanji (Eds.), *Early detection and intervention in audiology: An African perspective* (pp. 3–14). Wits University Press. https://doi.org/10.18772/22021026567.6

Khalid, U. B., Naeem, M., Stasolla, F., Syed, M. H., Abbas, M., & Coronato, A. (2024). Impact of AI-powered solutions in rehabilitation process: Recent improvements and future trends. *International Journal of General Medicine, 17,* 943–969. https://doi.org/10.2147/IJGM.S453903

Khoshrounejad, F., Hamednia, M., Mehrjerd, A., Pichaghsaz, S., Jamalirad, H., Sargolzaei, M., Hoseini, B., & Aalaei, S. (2021). Telehealth-based services during the COVID-19 pandemic: A systematic review of features and challenges. *Frontiers in Public Health, 9,* Article 711762. https://doi.org/10.3389/fpubh.2021.711762

Khoza-Shangase, K. (2021). Confronting realities to early hearing detection in South Africa. In K. Khoza-Shangase & A. Kanji (Eds.), *Early detection and intervention in audiology: An African perspective* (pp. 66–88). Wits University Press. https://doi.org/10.18772/22021026567.10

Khoza-Shangase, K. (2022a). Challenges and complexities with assessment and management of ototoxicity in South Africa. In K. Khoza-Shangase (Ed.), *Complexities and challenges in preventive audiology: An African perspective*. AOSIS Books. https://doi.org/10.4102/aosis.2022.BK311.06

Khoza-Shangase, K. (2022b). Complexities and challenges in preventive audiology within the African context. In K. Khoza-Shangase (Ed.), *Complexities and challenges in preventive audiology: An African perspective* (pp. 1–21). AOSIS Books. https://doi.org/10.4102/aosis.2022.BK311.06

Khoza-Shangase, K., & Masondo, N. (2020). What are the current audiological practices for ototoxicity assessment and management in the South African healthcare context? *International Journal of Environmental Research and Public Health, 17*(7), Article 2613. https://doi.org/10.3390/ijerph17072613

Khoza-Shangase, K., & Mophosho, M. (2021). Language and culture in speech-language and hearing professions in South Africa: Re-imagining practice. *South African Journal of Communication Disorders, 68*(1), Article a793. https://doi.org/10.4102/sajcd.v68i1.793

Khoza-Shangase, K., Moroe, N., & Neille, J. (2021). Speech-language pathology and audiology in South Africa: Clinical training and service in the era of COVID-19. *International Journal of Telerehabilitation, 13*(1), Article e6376. https://doi.org/10.5195/ijt.2021.6376

Khoza-Shangase, K., Moroe, N., Neille, J., & Edwards, A. (2022). The impact of COVID-19 on speech–language and hearing professions in low- and middle-income countries: Challenges and opportunities explored. *South African Journal of Communication Disorders, 69*(2), Article a937. https://doi.org/10.4102/sajcd.v69i2.937

Khoza-Shangase, K., Moroe, N., & Sebothoma, B. (2022). Conducting clinical research in the era of the COVID-19 pandemic: Challenges and lessons for speech-language pathology and audiology research. *South African Journal of Communication Disorders, 69*(2), Article a898. https://doi.org/10.4102/sajcd.v69i2.898

Khoza-Shangase, K., & Sebothoma, B. (2022). Tele-audiology and preventive audiology: A capacity versus demand challenge imperative in South Africa. In K. Khoza-Shangase (Ed.), *Preventive audiology: An African perspective* (pp. 45–87). AOSIS Books. https://doi.org/10.4102/aosis.2022.BK209.02

Kinsey, L. E., & Cherney, L. R. (2024). Measuring real-world talk time and locations of people with aphasia using wearable

Complimentary Author PDF: Not for Broad Dissemination

technology. *American Journal of Speech-Language Pathology, 33*(6S), 3247–3262. https://doi.org/10.1044/2024_AJSLP-23-00373

Kljajevic, V. (2024). Embracing virtual reality in rehabilitation of post-stroke aphasia. *DIGITAL HEALTH, 10*. https://doi.org/10.1177/20552076241271823

Kollmeier, B., & Kiessling, J. (2018). Functionality of hearing aids: State-of-the-art and future model-based solutions. *International Journal of Audiology, 57*(Suppl. 3), S3–S28. https://doi.org/10.1080/14992027.2016.1256504

Kouri, P., Kaija-Kortelainen, M., Kennedy, M. A., & Turjamaa, R. (2022). Ethical considerations in digital health. In C. W. Delaney, C. A. Weaver, J. Sensmeier, L. Pruinelli, & P. Weber (Eds.), *Nursing and informatics for the 21st century—Embracing a digital world, Book 1* (3rd ed., pp. 67–82). Productivity Press. https://doi.org/10.4324/9781003054849-4

Lee, S. A. S. (2019). Virtual speech-language therapy for individuals with communication disorders: Current evidence, limitations, and benefits. *Current Developmental Disorders Reports, 6*(3), 119–125. https://doi.org/10.1007/s40474-019-00169-7

Lin, M.-J., & Chen, C.-K. (2024). Breaking sound barriers: Exploring tele-audiology's impact on hearing healthcare. *Diagnostics, 14*(8), Article 856. https://doi.org/10.3390/diagnostics14080856

Lin, Y., Lemos, M., & Neuschaefer-Rube, C. (2021). Digital health and digital learning experiences across speech-language pathology, phoniatrics, and otolaryngology: Interdisciplinary survey study. *JMIR Medical Education, 7*(4), Article e30873. https://doi.org/10.2196/30873

Llorente, M., Podhorski, A., & Fernandez, S. (2024). Wearable voice dosimetry system. *Applied Sciences, 14*(13), Article 5806. https://doi.org/10.3390/app14135806

Louw, P. H., Odendaal, T., & Ramma, L. (2024). Mapping neonatal hearing screening services in Cape Town metro: A situational analysis. *African Journal of Primary Health Care & Family Medicine, 16*(1), Article a4386. https://doi.org/10.4102/phcfm.v16i1.4386

Lüdtke, U. M. (2023). Speech-language therapy in Sub-Saharan Africa: The emergence of a profession in a diverse multilingual and multicultural context. In U. M. Lüdtke, E. Kija, & M. K. Karia (Eds.), *Handbook of speech-language therapy in Sub-Saharan Africa: Integrating research and practice* (pp. 15–35). Springer International. https://doi.org/10.1007/978-3-031-04504-2_1

Mabasa, H. V. (2023). *Prevalence of ear pathologies and associated risk factors in children aged 0–7 years attending Voortrekker Hospital in Mokopane, South Africa* [Doctoral dissertation, University of Limpopo]. ULSpace. http://hdl.handle.net/10386/4442

Madahana, M. C., Ekoru, J. E., Sebothoma, B., & Khoza-Shangase, K. (2024). Development of an artificial intelligence based occupational noise induced hearing loss early warning system for mine workers. *Frontiers in Neuroscience, 18,* Article 1321357. https://doi.org/10.3389/fnins.2024.1321357

Madahana, M. C., Khoza-Shangase, K., Moroe, N., Mayombo, D., Nyandoro, O., & Ekoru, J. (2022). A proposed artificial intelligence-based real-time speech-to-text to sign language translator for South African official languages for the COVID-19 era and beyond: In pursuit of solutions for the hearing impaired. *South African Journal of Communication Disorders, 69*(2), Article a915. https://doi.org/10.4102/sajcd.v69i2.915

Madzivhandila, A. G., le Roux, T., & de Jager, L. B. (2024). Neonatal hearing screening using a smartphone-based otoacoustic emission device: A comparative study. *International Journal of Pediatric Otorhinolaryngology, 177,* Article 111862. https://doi.org/10.1016/j.ijporl.2024.111862

Mahmood, E., Hassan, N., Qazi, F., & Gohar, S. (2024). Effectiveness of game-based interactive approach using deep learning framework for dyslogia. *VFAST Transactions on Software Engineering, 12*(3), 11–22. https://doi.org/10.21015/vtse.v12i3.1863

Mallipeddi, N. V., Mehrotra, A., & Van Stan, J. H. (2023). Telepractice in the treatment of speech and voice disorders: What could the future look like? *Perspectives of the ASHA Special Interest Groups, 8*(2), 418–423. https://doi.org/10.1044/2022_PERSP-22-00098

Maluleke, N. P., Khoza-Shangase, K., & Kanji, A. (2024). EHDI services should be accessible! Caregivers' expectations of EHDI services in South Africa. *Speech, Language and Hearing, 27*(1), 43–57. https://doi.org/10.1080/2050571X.2023.2241219

Manning, W. G., & Pillay, M. (2020). A critical analysis of the current South African occupational health law and hearing loss. *South African Journal of Communication Disorders, 67*(2), Article a694. https://doi.org/10.4102/sajcd.v67i2.694

Marshall, J., Booth, T., Devane, N., Galliers, J., Greenwood, H., Hilari, K., Talbot, R., Wilson, S., & Woolf, C. (2016). Evaluating the benefits of aphasia intervention delivered in virtual reality: Results of a quasi-randomised study. *PLOS ONE, 11*(8), Article e0160381. https://doi.org/10.1371/journal.pone.0160381

McKearney, R. M. (2023). *Improving objective analysis of the auditory brainstem response* [Doctoral dissertation, University of Southampton]. University of Southampton Institutional Repository. https://eprints.soton.ac.uk/476506/

McNaney, R., Bull, C., Mackie, L., Dahman, F., Stringer, H., Richardson, D., & Welsh, D. (2018, April). StammerApp: Designing a mobile application to support self-reflection and goal setting for people who stammer. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (pp. 1–12).

Milne, V. A. (2021). Management of auditory processing difficulties virtually: A case study. *Seminars in Hearing, 42*(2), 98–106. https://doi.org/10.1055/s-0041-1731690

Mitra, S., Lakshmi, D., & Govindaraj, V. (2023). Data analysis and machine learning in AI-assisted special education for students with exceptional needs. In A. Kumar, A. Nayyar, R. Sachan, & R. Jain (Eds.), *AI-assisted special education for students with exceptional needs* (pp. 67–109). IGI Global. https://doi.org/10.4018/979-8-3693-0378-8.ch004

Möllmann, N. R., Mirbabaie, M., & Stieglitz, S. (2021). Is it alright to use artificial intelligence in digital health? A systematic literature review on ethical considerations. *Health Informatics Journal, 27*(4). https://doi.org/10.1177/14604582211052391

Moodley, S., Storbeck, C., & Gama, N. (2021). Ototoxicity: A review of South African studies. *South African Family Practice, 63*(1), Article a5187. https://doi.org/10.4102/safp.v63i1.5187

Moonsamy, S., Mupawose, A., Seedat, J., Mophosho, M., & Pillay, D. (2017). Speech-language pathology and audiology in South Africa: Reflections on transformation in professional training and practice since the end of apartheid. *Perspectives of the ASHA Special Interest Groups, 2*(17), 30–41. https://doi.org/10.1044/persp2.SIG17.30

Mophosho, M. (2018). Speech-language therapy consultation practices in multilingual and multicultural healthcare contexts: Current training in South Africa. *African Journal of Health Professions Education, 10*(3), 145–147. https://journals.co.za/doi/10.7196/AJHPE.2018.v10i3.1045

Moroe, N., Khoza-Shangase, K., Kanji, A., & Ntlhakana, L. (2018). The management of occupational noise–induced hearing loss in the mining sector in Africa: A systematic review—1994

Complimentary Author PDF: Not for Broad Dissemination

to 2016. *Noise & Vibration Worldwide, 49*(5), 181–190. https://doi.org/10.1177/0957456518781860

Moroe, N. F., & Khoza-Shangase, K. (2022). Complexities with hearing conservation programmes in South African mines: Applying complex interventions theory. In K. Khoza-Shangase (Ed.), *Complexities and challenges in preventive audiology: An African perspective* (pp. 125–140). AOSIS Books. https://doi.org/10.4102/aosis.2022.BK311.06

Mothemela, B., Ramma, L., & Swanepoel, D. W. (2025). Update on the state of audiology in South Africa. *International Journal of Audiology, 64*(3), 286–289. https://doi.org/10.1080/14992027.2024.2354511

Mtimkulu, T. K., & Khoza-Shangase, K. (2024). Help-seeking journey to accessing audiology services in a peri-urban community in South Africa. *South African Journal of Communication Disorders, 71*(1), Article a1002. https://doi.org/10.4102/sajcd.v71i1.1002

Nagdee, N., Sebothoma, B., Madahana, M., Khoza-Shangase, K., & Moroe, N. (2022). Simulations as a mode of clinical training in healthcare professions: A scoping review to guide planning in speech-language pathology and audiology during the COVID-19 pandemic and beyond. *South African Journal of Communication Disorders, 69*(2), Article a905. https://doi.org/10.4102/sajcd.v69i2.905

Naidoo, N., & Khan, N. B. (2022). Analysis of barriers and facilitators to early hearing detection and intervention in KwaZulu-Natal, South Africa. *South African Journal of Communication Disorders, 69*(1), Article a839. https://doi.org/10.4102/sajcd.v69i1.839

Ne, C. K. H., Muzaffar, J., Amlani, A., & Bance, M. (2021). Hearables, in-ear sensing devices for bio-signal acquisition: A narrative review. *Expert Review of Medical Devices, 18*(Suppl. 1), 95–128. https://doi.org/10.1080/17434440.2021.2014321

Nebeker, C., Leavy, V., Roitmann, E., & Steinhubl, S. (2020). *Ethical considerations when creating evidence from real world digital health data*. medRxiv. https://doi.org/10.1101/2020.01.16.20017806

Nielsen, A. C., Rotger-Griful, S., Kanstrup, A. M., & Laplante-Lévesque, A. (2018). User-innovated eHealth solutions for service delivery to older persons with hearing impairment. *American Journal of Audiology, 27*(3S), 403–416. https://doi.org/10.1044/2018_AJA-IMIA3-18-0009

Ntlhakana, L. (2022). Using machine learning systems to predict occupational hearing loss for mineworkers in South Africa: A case study of ethical challenges to research in preventive audiology in the mining industry. In K. Khoza-Shangase (Ed.), *Complexities and challenges in preventive audiology: An African perspective*. AOSIS Books. https://doi.org/10.4102/aosis.2022.BK311.09

Ntlhakana, L., Khoza-Shangase, K., & Nelson, G. (2020). Occupational noise-induced hearing loss in platinum miners: What do the data tell us? *Occupational Health Southern Africa, 26*(1), 8–14. https://hdl.handle.net/10520/EJC-1b5884ee41

Olusanya, B.O., Davis, A. C., & Hoffman, H. J. (2020). Hearing loss: Rising prevalence and impact. *Bulletin of the World Health Organization, 97*(10), 646–646A. https://pubmed.ncbi.nlm.nih.gov/31656325/

Orikpete, O. F., Dennis, N. M., Kikanme, K. N., & Ewim, D. R. E. (2024). Advancing noise management in aviation: Strategic approaches for preventing noise-induced hearing loss. *Journal of Environmental Management, 363,* Article 121413. https://doi.org/10.1016/j.jenvman.2024.121413

Paken, J., Govender, C. D., Pillay, M., & Sewram, V. (2016). Cisplatin-associated ototoxicity: A review for the health professional. *Journal of Toxicology, 2016*(1), Article 1809394. https://doi.org/10.1155/2016/1809394

Paken, J., Govender, C. D., Pillay, M., & Sewram, V. (2019). A review of cisplatin-associated ototoxicity. *Seminars in Hearing, 40*(02), 108–121. https://doi.org/10.1055/s-0039-1684041

Paken, J., Govender, C. D., Pillay, M., & Sewram, V. (2020). Perspectives and practices of ototoxicity monitoring. *South African Journal of Communication Disorders, 67*(1), Article a685. https://doi.org/10.4102/sajcd.v67i1.685

Patel, V., Chesmore, A., Legner, C. M., & Pandey, S. (2022). Trends in workplace wearable technologies and connected-worker solutions for next-generation occupational safety, health, and productivity. *Advanced Intelligent Systems, 4*(1), Article 2100099. https://doi.org/10.1002/aisy.202100099

Peerbhay, N., Munsamy, D. R., Dlamini, H. P., Langa, F., & Paken, J. (2024). The use of tele-audiology in ototoxicity monitoring: A scoping review. *Journal of Telemedicine and Telecare, 30*(3), 475–496. https://doi.org/10.1177/1357633X211068277

Petrocchi-Bartal, L., Khoza-Shangase, K., & Kanji, A. (2021). Implementing early hearing detection in the South African health care context. In K. Khoza-Shangase & A. Kanji (Eds.), *Early detection and intervention in audiology: An African perspective* (pp. 42–65). AOSIS Books. https://doi.org/10.18772/22021026567.10

Phanguphangu, M. C. (2017). Otoscopic examinations reveal high prevalence of outer and middle ear pathologies in paediatrics in Limpopo, South Africa. *International Journal of Audiology, 56*(4), 215–218. https://doi.org/10.1080/14992027.2016.1244868

Pillay, M. (2020). Chemicals, noise and occupational hearing health in South Africa: A mapping study. *South African Journal of Communication Disorders, 67*(2), Article a693. https://doi.org/10.4102/sajcd.v67i2.693

Pillay, M., Tiwari, R., Kathard, H., & Chikte, U. (2020). Sustainable workforce: South African audiologists and speech therapists. *Human Resources for Health, 18*(1), Article 47. https://doi.org/10.1186/s12960-020-00488-6

Platia, S. (2021). *Experience and satisfaction with hearing aid services delivered via teleaudiology in adult populations: A systematic review* [Doctoral Capstone Research Project, The City University of New York]. CUNY Academic Works. https://academicworks.cuny.edu/gc_etds/4348

Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., Britten, N., Roen, K., & Duffy, S. (2006). *Guidance on the conduct of narrative synthesis in systematic reviews: A product from the ESRC Methods Programme* (Version 1, Article b92).

Ramkumar, V., John, K. R., Selvakumar, K., Vanaja, C. S., Nagarajan, R., & Hall, J. W. (2018). Cost and outcome of a community-based paediatric hearing screening programme in rural India with application of tele-audiology for follow-up diagnostic hearing assessment. *International Journal of Audiology, 57*(6), 407–414. https://doi.org/10.1080/14992027.2018.1442592

Reddy, H., Joshi, S., Joshi, A., & Wagh, V. (2022). A critical review of global digital divide and the role of technology in healthcare. *Cureus, 14*(9), Article e29739. https://doi.org/10.7759/cureus.29739

Reinhart, L., Bischops, A. C., Kerth, J.-L., Hagemeister, M., Heinrichs, B., Eickhoff, S. B., Dukart, J., Konrad, K., Mayatepek, E., & Meissner, T. (2024). Artificial intelligence in child development monitoring: A systematic review on usage, outcomes and acceptance. *Intelligence-Based Medicine, 9,* Article 100134. https://doi.org/10.1016/j.ibmed.2024.100134

Repetto, C., Paolillo, M. P., Tuena, C., Bellinzona, F., & Riva, G. (2021). Innovative technology-based interventions in aphasia rehabilitation: A systematic review. *Aphasiology, 35*(12), 1623–1646. https://doi.org/10.1080/02687038.2020.1819957

ReportLinker. (2020, November 30). *The global telehealth/telemedicine market is expected to grow at a CAGR of 37.7%*

Complimentary Author PDF: Not for Broad Dissemination

during the forecast period, to reach USD 191.7 billion by 2025 from an estimated USD 38.7 billion in 2020. https://www.globenewswire.com/news-release/2020/11/23/2131539/0/en/The-global-telehealth-telemedicine-market-is-expected-to-grow-at-a-CAGR-of-37-7-during-the-forecast-period-to-reach-USD-191-7-billion-by-2025-from-an-estimated-USD-38-7-billion-in-.html

Robler, S. K., Coco, L., & Krumm, M. (2022). Telehealth solutions for assessing auditory outcomes related to noise and ototoxic exposures in clinic and research. *The Journal of the Acoustical Society of America, 152*(3), 1737–1754. https://doi.org/10.1121/10.0013706

Sadegh-Zadeh, S.-A., Soleimani Mamalo, A., Kavianpour, K., Atashbar, H., Heidari, E., Hajizadeh, R., Roshani, A. S., Habibzadeh, S., Saadat, S., Behmanesh, M., Saadat, M., & Gargari, S. S. (2024). Artificial intelligence approaches for tinnitus diagnosis: Leveraging high-frequency audiometry data for enhanced clinical predictions. *Frontiers in Artificial Intelligence, 7,* Article 1381455. https://doi.org/10.3389/frai.2024.1381455

Schuler, B. (2019). Applicable applications: Treatment and technology with practical, efficient and affordable solutions. In D. Geffner & D. Ross-Swain (Eds.), *Auditory processing disorders: Assessment, management, and treatment* (3rd ed., pp. 411–416). Plural.

Sebothoma, B. (2020). Middle ear pathologies in adults within the mining industry: A systematic review. *South African Journal of Communication Disorders, 67*(2), Article a679. https://doi.org/10.4102/sajcd.v67i2.679

Sebothoma, B., & Baloyi, N. (2024). Awareness of middle ear pathologies in South Africa: Towards a primordial preventive audiology. *South African Journal of Communication Disorders, 71*(1), Article a1026. https://doi.org/10.4102/sajcd.v71i1.1026

Sebothoma, B., & Khoza-Shangase, K. (2022). Challenges and complexities with assessment and management of middle ear pathologies in Africa. In K. Khoza-Shangase (Ed.), *Complexities and challenges in preventive audiology: An African perspective*. AOSIS Books. https://doi.org/10.4102/aosis.2022.BK311.05

Sebothoma, B., & Khoza-Shangase, K. (2023). Programmatic approach to hearing health in low- and middle-income countries. *The Hearing Journal, 76*(06), 28–29. https://doi.org/10.1097/01.HJ.0000938628.78258.4a

Smiley, C. S., & Murphy, B. A. (2024). Navigating the role of mobile audiology in public health: Overcoming hearing health care barriers that impact the underserved. *Perspectives of the ASHA Special Interest Groups, 9*(5), 1352–1366. https://doi.org/10.1044/2024_PERSP-23-00169

Spinardi-Panes, A. C., Lopes-Herrera, S. A., & Maximino, L. P. (2013). Aspectos éticos e legais na prática da telessaúde em fonoaudiologia [Ethical and legal aspects in the practice of telehealth in speech therapy]. *Revista CEFAC, 15*(4), 1040–1043. https://doi.org/10.1590/S1516-18462013000400035

Stark, B. C., & Warburton, E. A. (2018). Improved language in chronic aphasia after self-delivered iPad speech therapy. *Neuropsychological Rehabilitation, 28*(5), 818–831. https://doi.org/10.1080/09602011.2016.1146150

Suh, H., Dangol, A., Meadan, H., Miller, C. A., & Kientz, J. A. (2024). Opportunities and challenges for AI-based support for speech-language pathologists. In *Proceedings of the 3rd Annual Meeting of the Symposium on Human-Computer Interaction for Work* (pp. 1–14). Association for Computing Machinery. https://doi.org/10.1145/3663384.3663387

Sukhera, J. (2022). Narrative reviews: Flexible, rigorous, and practical. *Journal of Graduate Medical Education, 14*(4), 414–417. https://doi.org/10.4300/JGME-D-22-00480.1

Swanepoel, D. W. (2023). Advancing equitable hearing care: Innovations in technology and service delivery. *Folia Phoniatrica et Logopaedica, 75*(4), 201–207. https://doi.org/10.1159/000530671

Swanepoel, D. W., De Sousa, K. C., Smits, C., & Moore, D. R. (2019). Mobile applications to detect hearing impairment: Opportunities and challenges. *Bulletin of the World Health Organization, 97*(10), 717–718. https://doi.org/10.2471/BLT.18.227728

Tao, K. F. M. (2020). *Teleaudiology hearing aid consultations for adults: Towards innovating the service-delivery in clinical practice* [Doctoral thesis, The University of Western Australia]. https://doi.org/10.26182/5ed087eb4bb7e

Townsend, B. A., Mars, M., & Scott, R. E. (2020). The HPCSA's telemedicine guidance during COVID-19: A review. *South African Journal of Bioethics and Law, 13*(2), 97–102. https://doi.org/10.7196/SAJBL.2020.v13i2.00725

Tsoumbou, A. D. K. (2018). *Strategies for noise control in the mining of hard rock and processing of sedimentary rock* [Master's thesis, University of Johannesburg]. UJContent. https://hdl.handle.net/10210/269579

Vendruscolo, V., Cruz-Santos, A., & Morgado, J. C. (2023). Cognitive auditory training: Telerehabilitation vs. in-person training. *International Journal of Psychology and Neuroscience, 9*(3), 25–38. https://doi.org/10.56769/ijpn09303

Wasmann, J.-W. A., Lanting, C. P., Huinck, W. J., Mylanus, E. A. M., van der Laak, J. W. M., Govaerts, P. J., Swanepoel, D. W., Moore, D. R., & Barbour, D. L. (2021). Computational audiology: New approaches to advance hearing health care in the digital age. *Ear and Hearing, 42*(6), 1499–1507. https://doi.org/10.1097/AUD.0000000000001041

Wasmann, J.-W., Pragt, L., Eikelboom, R., & Swanepoel, D. W. (2022). Digital approaches to automated and machine learning assessments of hearing: Scoping review. *Journal of Medical Internet Research, 24*(2), Article e32581. https://doi.org/10.2196/32581

Wilson, A. (2024). *Preclinical investigations to optimize surgical restoration of symmetrical vocal fold vibration* [Doctoral dissertation, University of Pittsburgh]. D-Scholarship @Pitt. http://d-scholarship.pitt.edu/id/eprint/46557