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Perspectives on the use of Artificial Intelligence in Speech-Language Pathology: possibilities and limitations

Perspectivas sobre o uso da Inteligência Artificial Generativa na Fonoaudiologia: possibilidades e limitações

Perspectivas sobre el uso de la Inteligencia Artificial en Fonoaudiología: posibilidades y limitaciones

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Abstract

The incorporation of Generative Artificial Intelligence (GenAI) into healthcare has intensified, encompassing diagnosis, prognosis, telehealth, clinical decision support, and scientific production. In Speech-Language Pathology and Audiology, this process has occurred unevenly and still without specific national guidelines, despite advances in the automated analysis of speech, voice, language, and swallowing. This paper aims to critically synthesize the scientific literature and current institutional guidelines, discussing possibilities, limitations, and principles for the ethical and evidence-based use of AI in Speech-Language Pathology and Audiology. In assessment and diagnosis, machine learning models have shown promising performance in the classification of communication disorders, in addition to advances in videofluoroscopic swallowing studies. However, limitations persist, such as small sample

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sizes, low cultural diversity, and lack of external validation. In intervention, tools aimed at therapeutic personalization, monitoring, and telerehabilitation show potential, although they depend on professional supervision and integration with individualized plans. In education, AI represents a new paradigm, requiring attention to ethics, academic integrity, and technological literacy. International guidelines converge in stating that AI should act as a support tool, with human oversight, transparency, data protection, and rigorous validation. In scientific writing, its use is accepted as operational support, without replacing human authorship. AI constitutes a promising instrument to expand diagnostic, therapeutic, and scientific resources in Speech-Language Pathology and Audiology; however, it requires rigorous validation, algorithmic transparency, professional training, and ethical responsibility.

Keywords: Generative Artificial Intelligence; Speech-Language and Hearing Sciences; Digital Health; Research Ethics; Telerehabilitation.

Resumo

A incorporação da Inteligência Artificial Generativa (IAGen) na saúde tem se intensificado, abrangendo diagnóstico, prognóstico, telessaúde, suporte à decisão clínica e produção científica. Na Fonoaudiologia, esse processo ocorre de forma heterogênea e ainda sem diretrizes nacionais específicas, apesar dos avanços em análise automatizada da fala, da voz, da linguagem e da deglutição. Esta comunicação tem como objetivo sintetizar criticamente a literatura científica e as diretrizes institucionais vigentes, discutindo possibilidades, limitações e princípios para o uso ético e baseado em evidências da IA na Fonoaudiologia. Na avaliação e no diagnóstico, modelos de aprendizado de máquina têm mostrado desempenho promissor na classificação de distúrbios da comunicação, além de avanços em videofluoroscopia da deglutição. Entretanto, persistem limitações como amostras reduzidas, baixa diversidade cultural e ausência de validação externa. Na intervenção, ferramentas voltadas à personalização terapêutica, monitoramento e tele reabilitação apresentam potencial, embora dependam de supervisão profissional e integração com planos individualizados. No ensino, a IA configura um novo paradigma, demandando atenção à ética, à integridade acadêmica e à literacia tecnológica. Diretrizes internacionais convergem ao afirmar que a IA deve atuar como suporte, com supervisão humana, transparência, proteção de dados e validação rigorosa. Na escrita científica, seu uso é admitido como auxílio operacional, não substituindo a autoria humana. A IA se constitui como um instrumento promissor para ampliar recursos diagnósticos, terapêuticos e científicos na Fonoaudiologia, porém, necessita de validação rigorosa, transparência algorítmica, capacitação profissional e responsabilidade ética.

Palavras-chave: Inteligência Artificial Generativa; Fonoaudiologia; Saúde Digital; Ética em Pesquisa; Tele reabilitação.

Resumen

La incorporación de la Inteligencia Artificial Generativa (IAGen) en la salud se ha intensificado, abarcando diagnóstico, pronóstico, telesalud, apoyo a la toma de decisiones clínicas y producción científica. En Fonoaudiología, este proceso ocurre de forma heterogénea y aún sin directrices nacionales específicas, a pesar de los avances en el análisis automatizado del habla, la voz, el lenguaje y la deglución. Esta comunicación tiene como objetivo sintetizar críticamente la literatura científica y las directrices institucionales vigentes, discutiendo posibilidades, limitaciones y principios para el uso ético y basado en evidencia de la IA en Fonoaudiología. En la evaluación y el diagnóstico, los modelos de aprendizaje automático han mostrado un desempeño prometedor en la clasificación de los trastornos de la comunicación, además de avances en videofluoroscopia de la deglución. Sin embargo, persisten limitaciones como muestras reducidas, baja diversidad cultural y ausencia de validación externa. En la intervención, las herramientas orientadas a la personalización terapéutica, el monitoreo y la telerrehabilitación presentan potencial, aunque dependen de supervisión profesional e integración con planes individualizados. En la enseñanza, la IA configura un nuevo paradigma, que exige atención a la ética, la integridad académica y la alfabetización tecnológica. Las directrices internacionales convergen en afirmar que la IA debe actuar como apoyo, con supervisión humana, transparencia, protección de datos y validación rigurosa.

En la redacción científica, su uso se admite como apoyo operativo, sin sustituir la autoría humana. La IA se constituye como un instrumento prometedor para ampliar los recursos diagnósticos, terapéuticos y científicos en Fonoaudiología; sin embargo, requiere validación rigurosa, transparencia algorítmica, capacitación profesional y responsabilidad ética.

Palabras-clave: Inteligencia Artificial Generativa; Fonoaudiología; Salud Digital; Ética en Investigación; Telerehabilitación.

Introduction

Artificial intelligence (AI) encompasses computational systems capable of performing tasks that traditionally require human cognition, such as learning, pattern recognition, and decision-making. Among its branches, Generative Artificial Intelligence (GenAI) has gained particular prominence. GenAI is based on models capable of generating novel content, including text, images, audio, and computer code, through the learning of complex patterns extracted from large volumes of data[1]. In healthcare, the integration of these technologies has intensified over recent decades, with applications spanning diagnosis, prognosis, remote monitoring, screening, clinical decision support, education, and scientific production[2,3].

Although AI is frequently presented as a technology capable of enhancing the efficiency and accuracy of healthcare delivery, the literature indicates that its potential benefits coexist with risks related to bias, methodological limitations, lack of explainability, and ethical and regulatory challenges[4-6].

In Speech-Language Pathology and Audiology, a field dedicated to human communication in its biological, cognitive, linguistic, and sociocultural dimensions, as well as swallowing, hearing, and orofacial functions, the incorporation of GenAI presents particularly complex challenges[3]. Nevertheless, the adoption of these technologies has occurred heterogeneously and often without specific guidelines that adequately address the clinical, ethical, and scientific particularities of the profession.

Emerging studies have explored the use of machine learning algorithms and signal-processing techniques in the analysis of speech, language, and voice, with applications in screening, assessment, and clinical monitoring[2,5-7]. However, critical reviews have shown that many of these initiatives rely on small sample sizes, poorly representative datasets, and validation procedures restricted to experimental settings, thereby limiting their generalizability to real-world clinical practice[8,9].

This scenario has prompted professional associations and international scientific organizations to publish guidelines and position statements regarding the responsible use of AI in healthcare and scientific publishing. Within the field of Speech-Language Pathology and Audiology, the recommendations issued by the American Speech-Language-Hearing Association (ASHA) concerning the use of GenAI by clinicians, educators, and researchers are particularly noteworthy[10,11]. In the field of research and evidence synthesis, special attention has been given to the joint editorial statement published by Cochrane, the Campbell Collaboration, the Joanna Briggs Institute (JBI), and the Collaboration for Environmental Evidence, which establishes principles for governance, transparency, and human accountability in the use of GenAI[12].

Given the growing integration of GenAI across different healthcare contexts and the absence of specific, systematized guidelines for Speech-Language Pathology and Audiology in Brazil, a critical analysis is needed to support its responsible use. Despite its potential to assist clinical practice, education, research, and scientific writing, important gaps remain regarding the quality of available evidence, methodological limitations, and the ethical implications of its application. Therefore, this communication aims to critically synthesize the scientific literature and current institutional guidelines, discussing the perspectives, opportunities, and limitations of GenAI in Speech-Language Pathology and Audiology, while proposing considerations to guide its ethical, safe, and evidence-based use in accordance with international standards.

Description

Generative Artificial Intelligence in Speech-Language Pathology and Audiology Assessment and Diagnosis

The application of GenAI in speech-language pathology and audiology assessment and diagnosis has been extensively investigated, particularly through the automated analysis of acoustic, temporal, and prosodic speech and voice parameters[4-7]. Machine learning models have demonstrated promising performance in the classification of speech, language, and voice disorders, especially under controlled conditions and standardized protocols[2,6,7].

However, critical analyses of the literature have identified recurring methodological limitations, including small sample sizes, limited linguistic and cultural diversity, lack of external validation, and challenges related to model reproducibility[8,9]. In Speech-Language Pathology and Audiology, these limitations are particularly relevant because human communication is strongly influenced by sociocultural, dialectal, age-related, and contextual factors that are often underrepresented in datasets used for algorithm training[8,13].

Recent findings have reported significant advances in the use of GenAI for the analysis of Videofluoroscopic Swallowing Studies (VFSS) in dysphagia assessment and clinical decision support. Applications include the description of the pharyngeal phase of swallowing, segmentation and identification of the bolus and hyoid bone, as well as the detection of penetration and aspiration events. However, a unified and fully automated GenAI system capable of comprehensively analyzing VFSS and other instrumental assessment modalities has not yet been developed[14].

Despite the numerous advances enabled by GenAI, experts emphasize that healthcare professionals remain essential for determining the indication and conducting the examination, as well as for interpreting and stratifying the generated data. The expertise of specialized speech-language pathologists, supported by interdisciplinary collaboration, remains indispensable for the appropriate indication and execution of instrumental assessments[14].

Professional guidelines consistently state that GenAI-based systems should not replace specialized speech-language pathology and audiology assessments but rather serve as tools to support clinical decision-making[10,11]. Clinical judgment, integration of contextual information, and ethical responsibility remain the responsibility of the speech-language pathologist, in accordance with the understanding that GenAI is not capable of fully capturing the functional and contextual complexity of human communication, swallowing, voice, and hearing[3].

Generative Artificial Intelligence in Intervention, Rehabilitation, and Telerehabilitation

Within the context of speech-language pathology and audiology intervention, GenAI-based systems have been proposed for the personalization of therapeutic exercises, dynamic adjustment of difficulty levels, performance monitoring, and the provision of automated feedback[15,16]. These applications are particularly relevant in telerehabilitation settings, as they may promote treatment adherence, continuity of care, and therapeutic practice beyond the clinical environment[17].

However, the literature emphasizes that the effectiveness and safety of these tools depend on continuous clinical supervision, appropriate definition of therapeutic goals, and integration into individualized treatment plans[13,18,19]. Excessive automation may compromise the quality of care, reduce sensitivity to patient responses, and undermine the central role of the therapeutic relationship. Institutional guidelines therefore reinforce that GenAI should function as an operational and informational support tool while preserving the clinical leadership and ethical responsibility of the speech-language pathologist[10,11].

Generative Artificial Intelligence in Speech-Language Pathology and Audiology Education

Discussing the use of artificial intelligence in speech-language pathology and audiology education extends beyond simply listing available tools; it requires addressing a new educational paradigm in which technological innovation coexists with a commitment to Evidence-Based Speech-Language Pathology and Audiology.

The integration of GenAI into speech-language pathology and audiology education goes beyond its instrumental dimension, requiring critical reflection on its impact on the development of clinical reasoning, academic integrity, and professional ethics.

Recommendations issued by the ASHA emphasize that GenAI tools should be used with clearly defined educational objectives, faculty supervision, and ongoing evaluation, thereby avoiding uncritical dependence and the substitution of essential educational processes[10,11].

In this context, the adoption of GenAI should not be viewed as a strategy for replacing teaching practices, but rather as a resource capable of enhancing dynamic learning experiences when employed with clearly defined objectives, appropriate assessment parameters, and opportunities for continuous reassessment. Educators remain responsible for educational mediation and the critical supervision of learning processes, ensuring that technology contributes to the development of clinical reasoning rather than merely facilitating the automated execution of tasks.

For students, the use of GenAI requires recognition that these systems are fallible, may contain biases, and can generate incomplete or inaccurate information. Consequently, consultation of peer-reviewed scientific sources and specialized literature remains essential for knowledge construction.

Recent literature examining the use of GenAI in higher education indicates that its impacts extend beyond the technological dimension and are inseparably linked to institutional planning, faculty development, governance models, and the ethical principles that guide its adoption[19–21]. The integration of GenAI has the potential to enhance pedagogical practices, learning experiences, and educational processes, provided that it is supported by strategic planning, interdisciplinary collaboration, and robust ethical guidelines[19].

A study conducted in Latin America in 2022 identified applications ranging from predictive modeling and intelligent data analysis to assistive technologies and automated processing of educational content, with relevant contributions to improving educational quality[20]. However, more recent evidence suggests that benefits such as personalized learning and increased institutional effectiveness depend on the implementation of comprehensive integration strategies and remain limited when AI adoption occurs in a fragmented or unsystematic manner[21].

From an educational management perspective, improvements in engagement, satisfaction, and efficiency have also been reported, alongside challenges related to data privacy and algorithmic bias[22].

From a broader perspective, Durón and Jiménez-Preciado (2025), through a discursive mapping of scientific production on GenAI in higher education using Natural Language Processing techniques, observed the consolidation of terms such as "artificial intelligence," "higher education," and "generative AI." Their findings reinforce the emerging need for GenAI literacy, institutional investment, and educational policies that encompass faculty development, adequate infrastructure, and guidelines for the responsible use of the technology[23].

Therefore, the integration of GenAI into speech-language pathology and audiology education requires not only openness to technological innovation but also methodological and ethical rigor, ensuring a balance between modernization processes and the preservation of educational quality, pedagogical safety, and professional responsibility.

Methodological Limitations and Ethical Challenges of Generative Artificial Intelligence

A substantial proportion of studies on Generative Artificial Intelligence (GenAI) in healthcare present methodological limitations, including data bias, lack of standardization, limited reproducibility, and algorithmic opacity[8]. The opacity of AI algorithms hinders the explainability of automated decisions, which may compromise clinical trust and the auditing of automated decision-making processes[16,24,25].

Ethical issues such as data privacy, informed consent, information security, and professional accountability are widely discussed in the literature[13,18,24]. Current guidelines consistently emphasize that the use of AI does not transfer clinical or scientific responsibility. Healthcare professionals remain accountable for decision-making, critical interpretation, and the protection of patients and end users[10,11,12].

Use of Generative Artificial Intelligence in Scientific Writing in Healthcare and Speech-Language Pathology and Audiology

GenAI-based tools and academic platforms are increasingly being used to support scientific writing. Examples include literature summariza-

tion and synthesis systems, such as Consensus, as well as research-support tools integrated into platforms such as Google Scholar (Labs) and Science Lab, which assist in evidence identification, idea development, and conceptual organization of texts. These resources can support activities such as drafting manuscripts, language editing, suggesting text structures, and identifying relevant references, thereby enhancing productivity and facilitating access to relevant literature in Speech-Language Pathology and Audiology and other fields[18,26]. In Speech-Language Pathology and Audiology, these applications may also promote the internationalization of scientific production and reduce language barriers.

However, studies have identified important risks, including the generation of inaccurate information, fabricated references, and excessive standardization of scientific discourse[27]. International guidelines emphasize that GenAI tools cannot be considered authors and that their use should be explicitly disclosed in an appropriate section of the manuscript (e.g., before the reference list), specifying which tool was used and for what purpose, while clearly indicating that the human authors reviewed the content and assume full responsibility for the final manuscript[12].

The joint statement issued by international evidence-synthesis organizations reinforces that GenAI may assist with operational tasks but cannot replace critical judgment, intellectual responsibility, or methodological rigor[12]. ASHA guidelines are consistent with this perspective, emphasizing that, in Speech-Language Pathology and Audiology, scientific writing involves sensitive clinical and contextual interpretation that is incompatible with the replacement of human authorship[10,11].

Based on currently available guidelines and the international literature, the following perspectives are proposed regarding the use of GenAI in Speech-Language Pathology and Audiology:

1. GenAI should be used as a complementary tool in speech-language pathology and audiology practice.
2. GenAI systems should undergo rigorous and transparent clinical validation.
3. The use of GenAI should adhere to ethical principles, including data protection and informed consent.
4. Speech-language pathologists and researchers should receive appropriate training to ensure the critical and responsible use of these technologies.
5. The use of GenAI in scientific writing should be explicitly disclosed and does not replace human authorship by qualified experts.

Summary of International Guidelines on the Use of Generative Artificial Intelligence[10,11,12]

1. General Recommendations

- ASHA (2023, 2024) recognizes GenAI as a potentially useful tool, provided that it is employed as support for, rather than a substitute for, professional clinical and scientific judgment.
- The joint statement led by Cochrane, in collaboration with the Campbell Collaboration, JBI, and the Collaboration for Environmental Evidence, emphasizes that GenAI should be used transparently, under appropriate oversight, and with methodological rigor, particularly in evidence-synthesis processes.
- All documents highlight the need for continuous human oversight, assigning responsibility for the use, interpretation, and validation of GenAI-generated outputs to the professional.

2. Areas of Convergence Across Guidelines

- Ethical principles and professional responsibility: There is consensus that the use of GenAI must respect ethical principles, including confidentiality, data security, and the prevention of bias.
- GenAI as a complementary tool: The guidelines consistently state that GenAI does not replace essential human competencies, such as clinical reasoning, decision-making, and critical appraisal of evidence.
- Need for transparency: All guidelines advocate explicit disclosure of GenAI use, whether in clinical practice, research, or scientific writing.
- Recognition of limitations: There is broad agreement regarding risks associated with GenAI, including inaccurate information, algorithmic bias, and limited traceability of information sources.

3. Differences and Specific Considerations

- Scope of application: ASHA primarily focuses on the use of GenAI in clinical practice, education, and professional documentation, whereas the evidence-synthesis organizations concentrate

more specifically on the use of GenAI in systematic reviews and scientific evidence synthesis.
- Degree of regulation and guidance: ASHA documents provide predominantly educational and practice-oriented recommendations, whereas the Cochrane-led statement adopts a more normative and precautionary approach, emphasizing rigorous methodological validation.
- Acceptability of automation: While ASHA acknowledges broader applications of GenAI as an initial support tool, evidence-synthesis guidelines are more restrictive regarding the automation of critical stages and require systematic human validation.

Final Considerations

Artificial intelligence has significant potential to expand diagnostic, therapeutic, and scientific resources in Speech-Language Pathology and Audiology. However, its use should be guided by robust evidence, methodological validation, transparency, and ethical responsibility. The perspectives presented here represent only an initial step toward the development of field-specific guidelines, encouraging the critical and responsible use of these technologies in clinical practice, research, and scientific writing.

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