

INPLASY PROTOCOL

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None declared.

Applications Of Automatic Speech Recognition And Text-To-Speech Models To Detect Hearing Loss: A Scoping Review Protocol

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Review question / Objective: This scoping review aims to identify published methods that have used automatic speech recognition or text-to-speech recognition technologies to detect hearing loss and report on their accuracy and limitations.

Condition being studied: Hearing enables us to communicate with the surrounding world. According to reports by the World Health Organization, 1.5 billion suffer from some degree of hearing loss of which 430 million require medical attention. It is estimated that by 2050, 1 in every 4 people will experience some sort of hearing disability. Hearing loss can significantly impact people's ability to communicate and makes social interactions a challenge. In addition, it can result in anxiety, isolation, depression, hindrance of learning, and a decrease in general quality of life.

A hearing assessment is usually done in hospitals and clinics with special equipment and trained staff. However, these services are not always available in less developed countries. Even in developed countries, like the UK, access to these facilities can be a challenge in rural areas. Moreover, during a crisis like the Covid-19 pandemic, accessing the required healthcare can become dangerous and challenging even in large cities.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 11 January 2023 and was last updated on 11 January 2023 (registration number INPLASY202310029).

INTRODUCTION

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recognition or text-to-speech recognition technologies to detect hearing loss and report on their accuracy and limitations.

Background: Hearing enables us to communicate with the surrounding world. According to reports by the World Health Organization, 1.5 billion suffer from some degree of hearing loss of which 430 million require medical attention. It is estimated that by 2050, 1 in every 4 people will experience some sort of hearing disability. Hearing loss can significantly impact people's ability to communicate and makes social interactions a challenge. In addition, it can result in anxiety, isolation, depression, hindrance of learning, and a decrease in general quality of life.

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Rationale: Although there have been recent reviews on this topic, their aim and focus are different from this review. A previous study analyzed machine learning and automated methods in Hearing assessment, regardless of using speech for the test. Another paper reviewed methods for remote hearing tests with no emphasis on automatic or machine learning based methods. However, this scoping review aims to identify published methods that have used automatic speech recognition or text-to-speech recognition technologies to detect hearing loss. The scoping review will pave the way for more research on this critical subject.

METHODS

Strategy of data synthesis: Quantitative data synthesis.

Eligibility criteria: The Joanna Briggs Institute (JBI) guidelines are followed in defining the scope of the review. This review will include studies that use Automatic Speech recognition (ASR) or Text-to-speech (TTS) methods in any part

of the hearing assessment. It includes methods that are conducted remotely or in a controlled environment. Theses, Conference papers, peer-reviewed papers, book chapters, and preprints will be included in this study.

Studies that use machine learning techniques other than ASR and TTS in assessing hearing health are excluded. Moreover, methods that use remote testing but do not use ASR and TTS are excluded too:

- 1- Population: General population without age limit.
- 2-Concept: Effectiveness of ASR and TTS for autonomous Hearing tests.
- 3- Context: Theses, Conference papers, peer-reviewed papers, book chapters, and preprints.

Source of evidence screening and selection: Relevant studies will be identified through a systematic literature search in the following electronic databases: PubMed, ScienceDirect, IEEE, Acoustical Society of America, Springer, Scopus, Web of Science, medRxiv, and arXiv. The citation and the references of the identified studies will be searched for other relevant studies. No restriction on the publication date is imposed.

Two of the authors will independently review the title and abstract to check against the inclusion and exclusion criteria and any disagreements will be resolved by discussion or consulting a third author. Studies that are considered relevant to this review will be read in full by both authors. A PRISMA flow diagram will be used to illustrate the selection process.

Data management: Articles will be imported into reference manager software for managing and finding duplicate records. Articles will be exported to spreadsheet software using the reference manager software and checked manually for duplication by the authors.

Language restriction: Only research published in English will be considered.

Country(ies) involved: United Kingdom (The University of Manchester).

Keywords: automated hearing test; speech audiometry; autonomous Speech Reception Threshold, machine learning based hearing test.

Dissemination plans: The result will be published in peer-reviewed journals.

Contributions of each author:

Author 1 - Mohsen Fatehifar - The author developed and prepared the review protocol and will contribute to the selection and extraction process. The author will also prepare the manuscript of this review.

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Author 2 - Josef Schlittenlacher - The author contributes to the development of the review protocol and will critically review the manuscript of this review. The author will help in the selection and extraction process.

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Author 3 - David Wong - The author contributes to the development of the review protocol and will critically review the manuscript of this review. The author will help in the selection and extraction process.

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Author 4 - Kevin Munro - The author contributes to the development of the review protocol and will critically review the manuscript of this review. The author will help in the selection and extraction process.

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