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Scoping review: Assessing the applications and limitations of Behavioural Observation Audiometry (BOA) in paediatric audiology and ways to overcome its limitations

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ADMINISTRATIVE INFORMATION

Support - National School of Healthcare.

Review Stage at time of this submission - Piloting of the study selection process.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 2 May 2026 and was last updated on 2 May 2026.

INTRODUCTION

Review question / Objective This scoping review is being registered and undertaken as part of a MSc dissertation. The aim of the scoping review is to map the existing literature on BOA to help assess its applications in paediatric audiology, identify its limitations, and explore potential strategies to overcome its limitations.

Background Behavioural Observation Audiometry (BOA) is a behavioural assessment technique used in infants who are not yet behaviourally ready to perform visual Reinforcement Audiometry (VRA), typically of a developmental age of less than around seven months. The test involves observation of the patient's natural behavioural response to the sound stimuli played (Xie et al., 2025). BOA has a potential for assisting in early detection and intervention. However, its routine use is limited by inherent drawbacks, including high-risk of observer bias and habituation effects. As a result, many audiologists are reluctant to use

BOA in clinical practice. Current perspectives on the application and limitation in clinical paediatric audiology are mixed. Some researchers argue that BOA assesses an infant's response to sound and not the exact hearing threshold (Gans, 1987) and that because children habituate only limited responses can be obtained to address clinical question (Widen, 1993). Other research studies have suggested that BOA can be valuable in assessing hearing of low-functioning children (Wilson & Thompson, 1984, cited in Gans, 1987).

Substantial research findings have shown the benefits of early intervention in children with hearing loss and improved outcomes on speech and language development (Ching et al. 2017; Sabo 1999). British Academy of Audiology(BAA) reported inadequacies within paediatric audiology clinical practice in Lothian, Scotland. Specifically, they noted significant issues in the assessment, diagnosis, and treatment of children under five years of age (BAA, 2021). Some of the highlighted failures included the inaccurate selection of behavioural hearing assessments that were not

appropriate for the child's developmental age (including inappropriate use of BOA procedure), as well as the use of visual cueing to prompt a response when sound was presented (BAA, 2021). These failures led to misdiagnoses and missed opportunities for timely intervention. These failings in paediatric audiology had a significantly negative impact on spoken language acquisition in many of these children (BAA, 2021). Following the Lothian, the BOA clinical guideline was withdrawn and is currently under review. Similar issues to those seen in Lothian were identified in England, leading to Department of Health and social care commissioning a 3-month review, known as the Kingdon review, to examine how NHS England responded to failure in children's hearing services (Wise, 2025).

Rationale Improving the BOA testing technique can provide a window for earlier identification and intervention for infants with hearing loss, supporting age-appropriate speech and language development. Despite interesting research findings regarding different aspects of BOA, to the best of my knowledge, no scoping review has yet been conducted in this area. The aim of this scoping review is to synthesise the available literature on BOA, critically evaluate its applications and limitations. This is an important step towards minimising bias and improving the application and reliability of the BOA test. Together, these results will help to better inform professional guidelines on BOA in paediatric audiology.

METHODS

Strategy of data synthesis The following search strategy will be used for PubMed, and adapted as needed for different databases: ("Behavior* observation audiometry" OR "Behavioral auditory assessment" OR "Behavior* audiometry" OR "audiological tests" OR ("BOA" AND hearing) OR "Observer-based procedure" OR "Observer-based psychophysical procedure*" OR "Observer-based Psychoacoustic Procedure*") AND (Pediatric OR paediatric OR child* OR infant* OR baby OR babies OR toddler* OR newborn* OR neonat*).

Scopus, EMBASE (via Ovid), Medline (via Ovid platform), PubMed (via National center for Biotechnology information), the Cochrane Library (via Wiley), and PsycINFO (via Ovid) will be systematically searched. Additional sources will include the first 100 results retrieved from google scholar search. Further relevant studies will be identified through screening of reference lists, including those of the studies included in this scoping review, as well as the reference list of

relevant International and National clinical guidelines and publications from professional bodies on BOA.

Eligibility criteria Inclusion Criteria

1) Any studies that use BOA as an assessment method in the paediatric population, typically for young infants but including children up to 25 years of age with developmental delay or special needs in whom BOA is appropriate. 2) Studies on BOA providing information on the BOA procedures, and findings from the test, or useability or application in sufficient details. 3) Peer-reviewed research studies reporting original reports and, gray literature, including full-text conference papers and theses
Exclusion criteria:

1) Studies without full-text publication. For example, abstracts only. 2) All Studies that are not available in the English language. 3) Studies that are reviews papers or commentaries or opinions.

Source of evidence screening and selection

Papers retrieved from the systematic search will be imported into Rayyan software for all stages of data management, including the automatic detection of duplicate records. Following this, duplicate removal will be undertaken manually by author AQ. The remaining studies will then undergo manual title and abstract screening (by author AQ) to remove any studies that do not meet eligibility criteria. All studies that pass the initial abstract screening will undergo full-text review by author AQ. In addition, a sub-sample (at least 10%) of the papers will be independently reviewed by two authors to ensure consistency and reliability of screen decisions. Any disagreement between the reviewers regarding eligibility of papers of included will be resolved through discussions.

Data management Rayyan will be used to organise data and support the screening and data extraction process. The extracted data will be collated into a Microsoft Excel spreadsheet. A PRISMA flow diagram will be used to report the study selection process.

Reporting results / Analysis of the evidence The study selection process will be illustrated in accordance with Preferred Reporting Items for Systematic Review and meta-analyses – Extension for Scoping Reviews guidelines (Tricco et al., 2018). Key characteristics of all studies included in this scoping review will be summarised in tabular format using excel spreadsheet. Extracted information will include details such as study title, author (s), years of publication, study aim and any other relevant information related to the main aims. The summarised data will be synthesised and

reported narratively in accordance with scoping reviews guidelines (Tricco et al., 2018).

Presentation of the results PRISMA flow diagram will be used to report the selection process and key characteristics of the study will be presented in tabular format on excel spreadsheet.

Language restriction Studies that are available in the English language.

Country(ies) involved United Kingdom.

Keywords Behavioural Observation Audiometry (BOA); Infants; behavioural Audiometry; Paediatric Audiology; Hearing assessments.

Dissemination plans Following completion of this scoping review, the paper will be submitted to the University of Manchester dissertation submission system. As part of my academic course, I am expected to present the findings from my research to my academic supervisors and peers. I will also present the finding to my colleagues at my training hospital.

Ethical Approval: No ethical approval was required for this scoping review, as the data are extracted from previously published studies online.

Contributions of each author

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