

Introduction

A specific learning disorder with impairment in reading, also known as **dyslexia**, is a neurodevelopmental disorder characterized by persistent difficulties in accurate and/or fluent word recognition, impaired decoding, and spelling abilities (American Psychiatric Association, 2022). Children with dyslexia frequently show difficulties in prosodic processing. **Prosody**, defined as the “level of linguistic representation at which the acoustic-phonetic properties of an utterance vary independently of its lexical items” (Wagner & Watson, 2010, p.905), is an essential component for successful reading (Kuhn et al., 2010; Rasinski et al., 2011). For example, studies have reported that children with dyslexia perform poorly on prosodic tasks such as reiterant speech (e.g., Goswami et al., 2010) and show increased variability in processing prosodic cues, particularly in perceiving changes in the amplitude envelope at onset or rise time (e.g., Goswami et al., 2002). However, although some studies have examined prosodic characteristics in children with dyslexia, recent research still lacks a clear and comprehensive synthesis.

This systematic review synthesized research comparing prosodic abilities of children with dyslexia with their typically developing peers.

Method

Search Strategy

- PubMed and EBSCOhost (APA PsycInfo, Academic Search Complete, Eric databases), from November 2014 to November 2024;
- Adhere to internationally recognized guidelines: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Page et al., 2021).

Keywords

(“dyslexia” OR “reading disability” OR “reading disorder” OR “specific learning disorder”) AND (“child” OR “children” OR “student”) AND (“prosody” OR “prosodic” OR “intonation” OR “phrasing” OR “prominence” OR “rhythm” OR “stress” OR “chunking” OR “pitch” OR “f0” OR “fundamental frequency” OR “intensity” OR “duration” OR “shortening” OR “lengthening” OR “speech rate” OR “pauses”).

Eligibility Criteria

Studies should meet all of the following criteria: (1) included children formally diagnosed with dyslexia aged 10 years or younger with no additional diagnosed developmental, neurological, or sensory disorders reported; (2) included a control group of typically developing children; (3) reported at least one quantitative measure of prosodic skills; and (4) published in English, Portuguese, or French.

Data Extraction | Study Selection (see figure 1)

The study selection followed three main steps, conducted independently by two reviewers:

- Identification:** Studies were identified through systematic searches;
- Screening:** Titles and abstracts were independently screened, and full-text articles were reviewed for eligibility according to predefined inclusion criteria;
- Inclusion:** Studies that met all criteria were included in the final synthesis.

Results

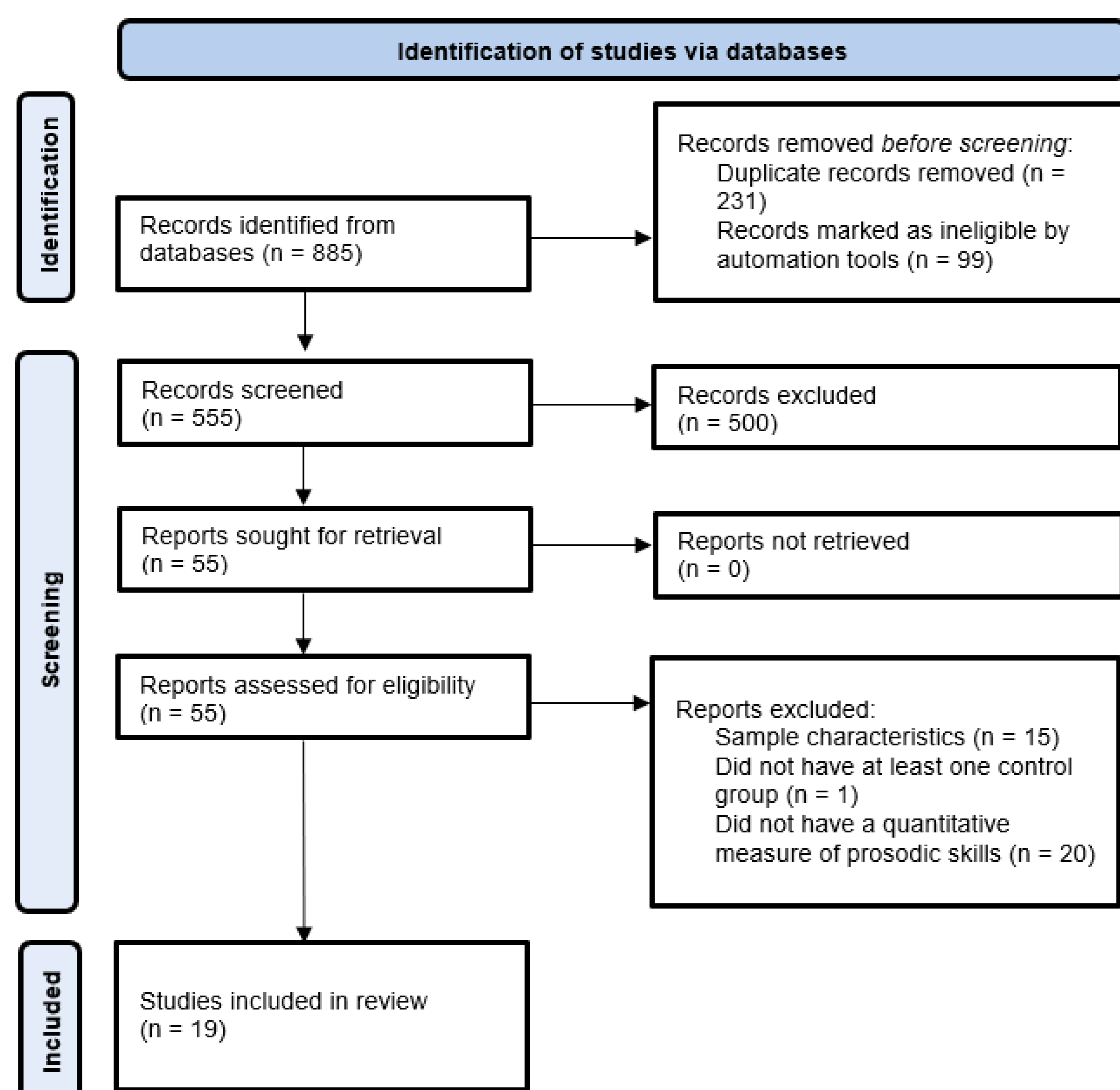


Figure 1. Preferred Reporting Items in Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of selection of studies.

- The included studies covered a wide linguistic diversity: English ($n = 6$), Chinese ($n = 4$), Spanish ($n = 3$), Italian ($n = 2$), French ($n = 2$), Japanese ($n = 1$), and Brazilian Portuguese ($n = 1$).

At the perception level, children with dyslexia exhibited:

- difficulties in lexical stress and lexical tone** compared to chronological age-matched typically developing (TD) children (Jiménez-Fernandez et al., 2015; Tong et al., 2017; Wang et al., 2019).
- difficulties in rising frequency and auditory frequency processing** (Flanagan et al., 2024; Wang et al., 2019), **in rise time** (Tong et al., 2017; Flanagan et al., 2024), as well as **in duration discrimination** (Flanagan et al., 2024) compared to both age and reading-level matched TD children.
- impairments in prosodic tasks relevant to pitch changes** compared to chronological age-matched TD children (Wang et al., 2022).
- atypical neural responses** compared to both age and reading-level matched TD children (Araújo et al., 2024; Keshavarzi et al., 2022).
- poorer duration discrimination** and **beat perception** compared to chronological age-matched TD children (Bégel et al., 2022).
- no significant differences in the interval comparison tasks** compared to chronological age-matched TD children (Lee et al., 2015).

At the production level, it was found:

- difficulties in melodic variation, limitations in the range of the melodic change, difficulties in distinguishing between vowel types, and atypical rhythmic alternation in stress patterns** during reading aloud compared to chronological age-matched TD children (Alves et al., 2014).
- impairments in producing syllable stress patterns, and significantly poorer performance in producing the amplitude envelope of multi-syllabic targets** compared to both age and reading-level matched TD children (Keshavarzi et al., 2023).
- faster tapping** and **reduced beat synchronization**, though adaptation to tempo change was preserved compared to chronological age-matched TD children (Bégel et al., 2022).
- difficulties in a rhythm imitation task** compared to chronological age-matched TD children (Lee et al., 2015).

Discussion / Conclusion

Results showed that **children with dyslexia consistently exhibit poorer prosodic skills compared to typically developing peers**. However, more studies in languages other than English are needed to capture cross-linguistic differences, and addressing the poor reliability of current measurement tasks is crucial. This knowledge is essential for a comprehensive analysis of existing differences and for informing targeted interventions. Potential intervention approaches could include training to distinguish between different stress patterns and intonation contours, identify the location of stress within words, manipulate prosodic features metalinguistically, and produce stress accurately.

