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Educational practices for the language development of students with intellectual developmental disorder in the school setting: a systematic review

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Background: Intellectual development disorder (IDD) is a challenging disorder that professionals, most notably teachers, are confronted with daily. Supporting oral language in the classroom is a complex challenge as teachers are expected to implement effective methods to support students' language. However, they face a persistent scarcity of scientific evidence to draw upon in their practice.

Aims: This research provides a first overview of instructional methods and their effectiveness in this population.

Method: Our search was conducted through various databases, generating a total of 931 articles. Data from the 14 selected studies were analyzed.

Outcomes and results: The results reveal limited, heterogenous, and hardly comparable studies in terms of their characteristics (samples, language area, strategies, and effectiveness measures) suggesting a low level of evidence regarding the effectiveness of these practices.

Conclusion and implications: We discuss the implications of these findings in light of the different factors contributing to the interventions' effectiveness, as well as considering the issue of transfer and generalization of acquired skills in IDD. We also reveal the urgent need for developing methods addressing cognitive load limitations such as implicit learning approaches, to enhances effectiveness and compensate the gap of available resources tailored to improve oral language outcomes in the IDD population.

KEYWORDS

intellectual developmental disorder, language, educational practices, school setting, systematic review

Introduction

Intellectual Developmental Disorder (IDD) affects 1 to 2% of the general population (INSERM, 2016), presenting challenges for caregivers, healthcare professionals, and teachers in all educational settings. These challenges stem from the complex cognitive profiles of IDD, as weak cognitive abilities affect many areas of development and learning (e.g., Tungate and Conners, 2021), such as limited working memory skills, widely associated with poor learning

and academic outcomes (e.g., Will et al., 2016). Additionally, language development, in all its components (content, form, and use) is one of the most significant areas of concern in children with IDD (Laws and Bishop, 2003; Sepúlveda et al., 2013; Abbeduto et al., 2016), as it is also closely linked to cognitive skills (Karmiloff-Smith, 1992; Mason-Apps et al., 2018, as cited in Van Der Schuit et al., 2011; Filipe et al., 2022). Language disorders can also vary widely within this population, due to individual differences and heterogeneity of cognitive and clinical profiles. Many theoretical approaches throughout the years have sought to explain the development of IDD and its associated delays, including language delays (Pinker, 1991; Karmiloff-Smith, 1998, 2012; Hauser et al., 2002). Prominent approaches have studied IDD from biological (genetic syndromes), cognitive (attention, short-memory, and language deficits), neurological (e.g., epilepsy) and environmental perspectives (e.g., exposure to toxins, infections, or trauma). While each of these approaches provides a different perspective on the causes of IDD, recent research further contributed to a better understanding of IDD and its underlying mechanisms and functioning, suggesting a more global approach that highlights the importance of considering multiple factors when apprehending IDD (for a review, Courbois and Facon, 2014). For instance, neuro-constructivism is a methodological and theoretical approach that combines elements from the aforementioned theories, suggesting that developmental trajectories of IDD are a product of the constant interaction of genetic, neurological, behavioral, and environmental constraints (Karmiloff-Smith, 2012). This approach moves away from comparing IDD individuals' development to typical populations matched on developmental or chronological age. Alternatively, it stresses the impact of the different internal (genetics, cognitive functions, co-occurring neurodevelopmental disorders), and external factors (interaction and interventions within the environment) shaping each individual's developmental trajectory, thus contributing to the heterogeneity of profiles found in the IDD population. Most importantly, this approach sheds light on the importance of activity, namely intervention, and support, in the development of individuals with IDD.

Despite people with IDD's capabilities being historically underestimated due to their intellectual challenges (e.g., Turner and Alborz, 2003), society has largely changed its perception of people with IDD, leading to a better overall quality of life for them (Spooner and Brown, 2017). Following the UNESCO Salamanca Statement of 1994 which established that all students should have the opportunity to learn together using teaching methods that address their individual needs (UNESCO, 1994) access to learning for all children in mainstream school has been enabled (UNESCO, 2019, p. 6, as cited in Sambuis and Bourdin, 2024). Consequently, deinstitutionalization has become a growing trend in countries like Canada, England, Norway, Sweden, and USA (Beadle-Brown et al., 2007, as cited in Reichow et al., 2019), as well as France. Indeed, the 2005 (no. 2005-102) & 2013 (no. 2013-595) French laws for inclusion mandate that students be provided with learning methods based on their individual needs, not their disabilities, recognizing that all children can learn and progress (Ibernon and Berzin, 2016). Therefore, in line with these policies and the neuro-constructivist approach, cognitive and adaptative skills in IDD should be developed and are shown to improve with support, such as educational and therapeutic interventions targeting language development (Van Der Schuit et al., 2011; Smith E. et al., 2020; Moraleda-Sepúlveda et al., 2022). For example, in their systematic review, Moraleda-Sepúlveda et al. (2022), highlight the effectiveness of language intervention programs addressed to people with Down Syndrome (DS) across educational and speech therapy settings. Most of the eighteen selected studies were conducted with school-age children, as well as in an individual format. These findings shed light on the importance of these interventions throughout lives of individuals with DS. However, in addition to individual differences, as well as to presenting with a variety of cognitive profiles, children with IDD's language profiles can vary in severity depending on the language area being considered. For instance, subjects with IDD can have better receptive vocabulary skills than expected from their developmental age, compared to other language areas (Facon et al., 2002; Næss et al., 2011; Mason-Apps et al., 2020), They also show better pragmatic skills (use of language) relative to other language areas, however still less efficient compared to typically developing peers (Smith et al., 2017). On the other hand, syntactic development, especially in expression, seems to be more affected by intellectual skills (e.g., Abbeduto et al., 2016; Katsarou and Andreou, 2022). Additionally, children with Down Syndrome may face specific challenges with articulation, phonology, and speech intelligibility, partly due to their unique oral-motor challenges (Martin et al., 2009; Pochon et al., 2017, 2022; Ibernon et al., 2018). Phonology and syntax development in these individuals can also be affected by weak cognitive functions (Abbeduto et al., 2016; Burgoyne et al., 2021), particularly poor verbal short-term memory affecting the ability to effectively detect and store phonetic patterns and poor sustained attention skills (Jarrold et al., 2002; Frenkel and Bourdin, 2009; Næss et al., 2011; Faught et al., 2019).

Therefore, language is critical area of concern in the development of individuals with IDD, especially during their academic years. Communication, language, and literacy are central to academic curricula and inclusive practices, as they are essential for social inclusion (Martini-Willemin, 2013; Smith M. et al., 2020), learning (e.g., Eadie et al., 2021), self-determination, and overall better quality of life (Wehmeyer and Schwartz, 1998; Horn and Kang, 2012; Wehmeyer et al., 2013). For instance, given the fundamental role of language in developing emotional skills, it is crucial to provide early therapeutic and educational language interventions to prevent the establishment of inappropriate social behaviors often observed in individuals with IDD (e.g., Cook and Oliver, 2011, as cited in Ibernon et al., 2018). Additionally, besides parents, teachers play a vital role in supporting language development, given the significant time children with IDD spend with them in school (Biggs and Meadan, 2018). Research also shows that collaborative interventions involving parents and various care services lead to better language outcomes (see Bronfenbrenner's Ecological Systems Theory), especially in meaningful contexts such as school-based interventions, in contrast with clinical or decontextualized setting (Wilcox et al., 1991). However, educators often face challenges in improving children with IDD's oral language skills due limited training and resources, as well as limited access to professionals such as speech and language therapists due to market saturation. Additionally, the diversity of profiles encountered in special education, as well as general education classrooms, makes it even more difficult for teachers to provide effective tailored language intervention (Knight et al., 2018; see also Frangieh and Weisser, 2013).

To date, studies reporting on language interventions for children with IDD have primarily focused on clinical one-on-one

interventions, such as in the speech-language pathology setting (e.g., Moraleda-Sepúlveda et al., 2022) or parent-mediated interventions (e.g., Kaiser and Roberts, 2013; O'Toole et al., 2018; LeJeune et al., 2022). Few studies have included the IDD population specifically, as they generally only include the autism spectrum disorder (ASD) population, or only a specific etiology such as Down Syndrome (see Seager et al., 2022). Studies also tend to merge IDD with other neurodevelopmental disorders in reviews and interventions. In the school setting, studies have mainly reported on instructional practices aiming to develop literacy and written language skills such as reading (Browder et al., 2006; Allor et al., 2010; Wood-Fields et al., 2015; Afacan et al., 2018; Reichow et al., 2019; Sermier Dessemontet et al., 2019; Brassard et al., 2021), as well as behavioral and cognitive interventions targeting an array of skills non-specific to language (e.g., Poirier and Florigan Ménard, 2013; Snyder and Huber, 2019), or specifically targeting the ASD population (e.g., Dixon et al., 2017). Other studies and reviews have also largely focused on functional life skills, such as vocational skills, and self-help (e.g., Bouck and Bone, 2018), with only a recently increased interest in "cognitive academics" (Shurr and Bouck, 2013). Finally, literature has extensively reported on Augmentative and Alternative Communication (AAC) use in IDD, which does not target language directly but is proven to effectively support the development of many areas of language and communication (for a review, O'Neill et al., 2018). However, AAC tends to be associated with complex communication needs found in more segregated settings, as few studies indicate AAC use in inclusive settings (Mirenda, 2014, as cited in Iacono et al., 2022). AAC use in school is also rarely associated with improvement of peer interaction and socialization, as AAC use by peers and teachers' training remain limited (e.g., Barker et al., 2013). Therefore, as communication and social inclusion of students with IDD are central themes in educational settings, developing oral language skills remains crucial. These methods shall rely on strategies such as AAC use (e.g., signs, picture symbols etc.), as combining oral language intervention with AAC methods is used in effective oral language therapies such as in SLT settings (e.g., Snell et al., 2010).

To our knowledge, no published study has reviewed available, reported, research, or evidence-based educational intervention on the oral language of students with IDD in school settings.

Objectives

The primary aim of this review is to identify teachers' practices aiming to develop the oral language skills (i.e., expressive phonology, vocabulary, grammar/syntax, and narration) of children and adolescents with IDD in the school context, as well as to highlight the reported outcomes of these practices, for a better understanding of ways in which teachers can improve students with IDD's oral language skills. Thus, three elements were examined:

1. The reported oral language interventions targeting students with IDD within all types of educational settings.
2. The oral language outcomes of these interventions in students with IDD.
3. The additional factors influencing the outcomes of the interventions (dosage, support and means of intervention, treatment focus such as general language intervention, domain-specific intervention).

Method

Identification

We conducted a search for reports in databases including Web of Science, EBSCOHost (PsycArticles, PsycInfo), ScienceDirect, ERIC, PubMed, and HAL using the keywords intellectual disability, oral language, educational practices, and their synonyms and extensions, both in English and French for each database where language filters were not available, using the "or" and "and" terms (Table 1). We also searched reference lists of reviews and meta-analyses, as well as manually searched in key journals. Duplicates were removed while screening abstracts, and the remaining articles were assessed in full text for eligibility.

Selection

We included studies targeting the population of students (children and adolescents) with IDD in the school setting. In order to be selected, the studies should explicitly mention the IDD/ID/MR/DD/LD or Down Syndrome, Fragile X, and Williams Syndrome diagnosis in its population. The search terms "mental retardation," "developmental disabilities" and "learning disorders" were used as ID to broaden our scope as IDD is often mentioned as such in older studies or studies using different terminology. We also chose to include studies targeting Down Syndrome students as it is the first genetic cause of IDD (de Graaf et al., 2015). Other aetiologies associated with genetic syndromes were also included in order to further broaden our spectrum of research. Children with IDD caused by environmental factors mentioned in the studies (e.g., fetal alcohol syndrome), were included, being one of the leading environmental causes of IDD and therefore cannot be excluded from the population. Studies targeting students with ASD associated with ID were not included due to the particularities of their social communication and language functioning. Students with IDD in the context of cerebral palsy with severe motor disabilities were excluded as well, due to the need for particular adaptations in interventions and instruction with regard to their movement restrictions.

Types of studies

We searched for all types of intervention designs, of any duration and delivery method. These interventions were delivered by teachers or teacher assistants (or researchers from research-based interventions) or meant to be delivered by teachers in any school setting. They were designed to improve any area of speech and/or expressive language abilities (articulation/phonology/speech, vocabulary/lexicon, syntax/morphosyntax, narration) in children with IDD. We included quantitative studies, as well as teacher-reported promising interventions, qualitative research, and evidence-based and research-based, teaching practices for students with IDD. We also included studies for neurodevelopmental disorders,

TABLE 1 Key-words/search filters used in the identification process.

Language	Criteria 1	Criteria 2	Criteria 3	Criteria 4
English	Intellectual disability Intellectual disorder Down syndrome/T21 Williams Syndrome Fragile X Syndrome Developmental disorder/delay Mental retardation Learning disability/disorder	Language Oral language Expressive language Oral communication Speech Vocabulary Morphosyntax MLU Narration	Instruction Education Intervention Strategies Practices Teaching	Students School Classroom Children Adolescents
French	Déficience intellectuelle Retard mental Handicap intellectuel Trouble du développement intellectuel Trisomie 21/Syndrome de Down Syndrome de Williams X fragile	Langage Langage oral Communication orale Langage expressif Phonologie Vocabulaire/Lexique Syntaxe/Morphosyntaxe LME Narration/Récit	Enseigner Intervention Développement Pratiques Éducation	Élèves École Classe Enfants Adolescents

learning disorders, and language disabilities including students with IDD in their sample, as well as general intervention programs or reading interventions including intervention on oral language (results for oral language outcomes explicitly mentioned). The studies examining practices in all educational settings (special education, integration, inclusive settings) were selected. Finally, due to the limited number of studies, we included dissertations and theses (gray literature).

Excluded studies/interventions

We excluded interventions targeting reading and writing skills only without outcome measures on oral language, and interventions focusing on general cognitive training not specific to language, interventions targeting non-verbal pragmatics skills, intervention aiming at developing AAC skills or only functional communication skills through AAC. Studies not published in English or French, studies focusing only on adults with IDD, and studies targeting the ASD population only were not included. Were also excluded no-access articles, non-teacher mediated interventions; interventions conducted outside of the school setting meant to be applied in clinical or at-home settings.

Screening strategy

We established a coding strategy for the selected studies detailing the characteristics of each study. More specifically, we coded: the database, the title, the authors, the citation in APA format, the summary, the type of study, study goals, sample size, and age, the area of language on which intervention is conducted, intervention details (individual or group), frequency of the intervention sessions, results and main conclusions.

A total of 931 articles were identified through our aforementioned database search and ancestral manual search. After screening the titles and abstracts and applying the inclusion and exclusion criteria, we obtained a total of 44 articles. Out of these, 30 were excluded as they did not focus on the object of study or did not meet our criteria, leaving us with a final sample of 14 articles. The process is detailed in Figure 1.

Results

The descriptive analysis of the characteristics of the studies is summarized in Table 2.

Synthesis of interventions by language domain

This section summarizes the intervention facilitators, delivery methods, tools, effectiveness, and limitations of our selected studies, organized by language component. It is important to note that two interventions targeting both oral and written language were selected in our sample. In their study, Mims et al. (2012) used a comprehensive literacy approach to develop students with ID's vocabulary, comprehension, writing and research skills, and Burgoyne et al. (2012) used a language and literacy intervention to train both reading and language skills. In this review, we are solely interested in the oral language (phonology, expressive vocabulary, morphosyntax, narration) outcomes of the interventions.

Phonology

Phonology or pronunciation is the least mentioned outcome in the selected interventions. McGuire (2014) reported that teachers face difficulties targeting phonological skills, as they mostly rely on speech and language therapists' advice when available. However, some teachers use everyday tools such as story readings, poems and songs, as well as natural conversations in which they use strategies like recasts and repetitions. Other strategies include manual signs such as the Suzanne Borel-Maisonny multi-sensory phonetic and gestural approach, as well as non-speech global and oral-motor exercises. Progress assessments tend to be informal, through spontaneous conversations. On the other hand, pronunciation was a secondary goal in the study that reported on teacher experiences using echo albums, which are oral language educational tools created in collaboration with the teachers (Dusseaux, 2018). In fact, the teachers worked on

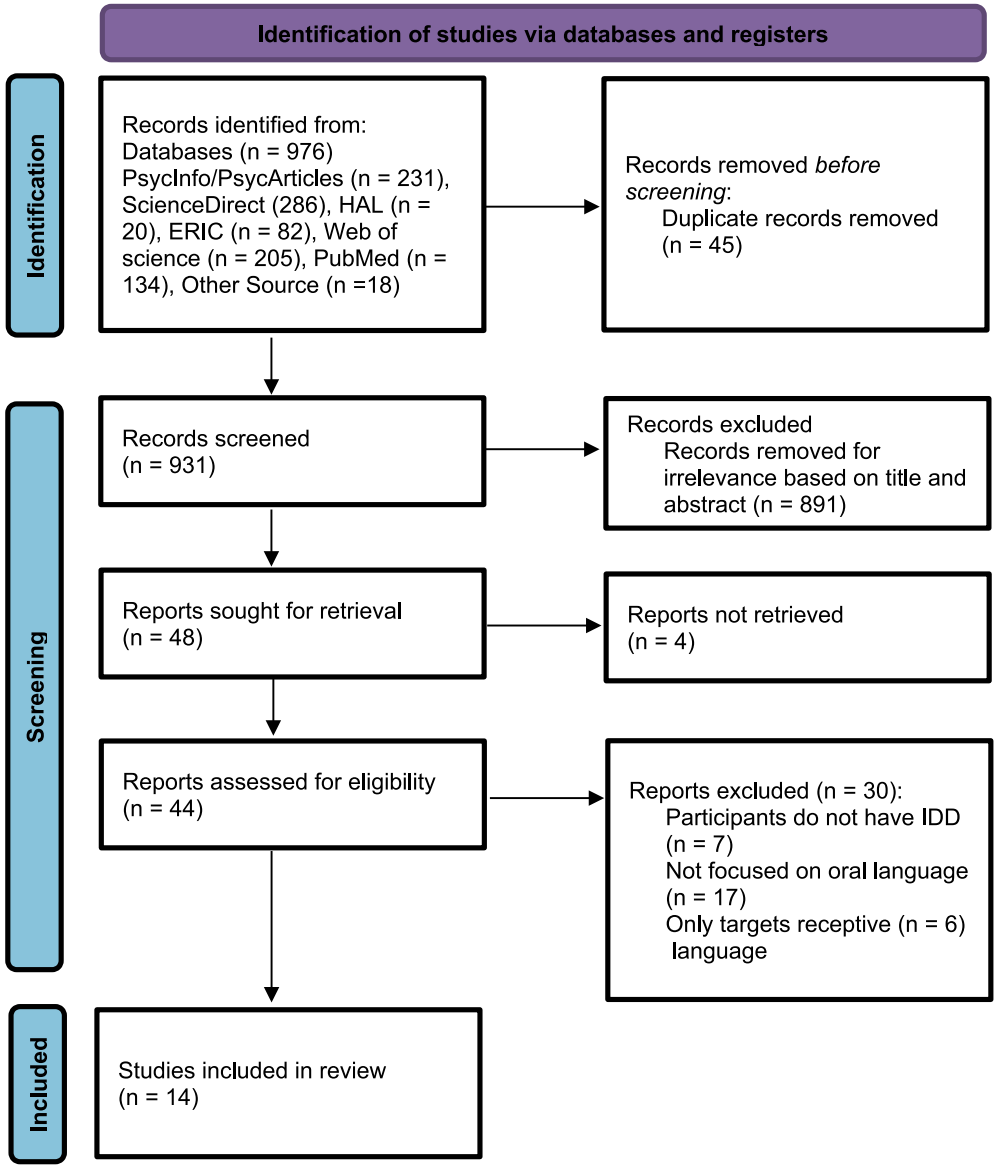

FIGURE 1
Flowchart of the different phases of the review.

sound articulation during interactions based on the albums, employing strategies such as recasts, repetitions, and isolation and modeling of incorrect sounds. This study did not measure the effectiveness of the intervention in terms of language outcomes, but rather focused on the teachers' experience using the tool with children with IDD.

Vocabulary

Vocabulary is a commonly targeted language area for children with IDD, as expressive vocabulary was included in 6 studies, with one study exclusively targeting expressive and receptive vocabulary skills in children with Down Syndrome (Næss et al., 2022). Vocabulary measures were often included among other oral language measures, obtained through the interventions. In the first study, Mims et al. (2012) demonstrated the effectiveness of a comprehensive literacy intervention that included systematic and direct instruction on the acquisition of literacy skills, for 15 students with moderate to severe developmental disabilities. The curriculum-based intervention aligned with middle school ELA standards, using scripted lessons based on evidence-based teaching practices and universal design for learning (UDL) principles, all organized in themed units. Materials included adapted literature, writing journals, and vocabulary cards adapted to student levels. Regarding the unit vocabulary learning part of the intervention, students were presented with four words per round of vocabulary lessons. The rounds started with no time delay, then time delay was used for responses to occur. Each target word was produced by the teacher and pointed at before the student imitated the model, or the students were to find words, labelled picture symbol, or labelled photograph corresponding to a definition. Incidental learning was encouraged by prompting all students to watch as peers took a turn finding a word. This intervention significantly improved vocabulary

TABLE 2 Summary of the selected studies' characteristics.

Studies	Participants	Intervention	Oral language area	Outcome measures	Dosage	Effects	Transfer
Baxter et al. (2022)	• $n = 52$, years 3–6 • Ages 7–11 • DS	Past Tense Intervention (PaTI) program	Grammar/Syntax	Regular simple past tense, narrative MLU, total use of words and NDW	10 weeks Daily sessions 20 min	Significant gains on all measures ($p < 0.005$). Regular simple past tense use (d = 3.12) Narrative Retell (d = 1.92).	No transfer to measures of grammar Transfer to untaught verbs. Maintenance 12 to 14 weeks
Bunning et al. (2017)	• $n = 11$ • ID • Ages 12;3–16;2	Storysharing for storytelling	Narration	Discourse and narrative skills	15 weeks Once/week 30 min	No change in discourse. Improved topic maintenance.	N/A
Burgoyne et al. (2012)	• $n = 57$, primary school years 1–5 • DS • Ages 5; 2–10; 0	Reading and language intervention	Vocabulary	Reading, taught vocabulary, receptive and expressive vocabulary and expressive grammar	40 weeks Daily sessions 40 min	Moderate effects on reading and taught expressive vocabulary ($p = 0.64$; d = 0.42)	Small transfer to untaught words. No transfer to other measures of literacy or standardized tests.
Dusseaux (2018)	• $n = 4$ special educators • students with ID, DD and DS • ages 7–14	Echo albums	Phonology Vocabulary Grammar/Syntax	Teacher experience using the oral language tool.	2 years	N/A	N/A
Hettiarachchi (2016)	• $n = 30$ • mild–moderate ID • ages 3; 2–15; 0	Colorful semantics	Narration	Story retelling Story generation and MLU.	6 weeks Twice/day	Progress in qualitative measures. Significant progress in MLU ($p < 0.001$), content ($p < 0.001$), number of complex structures ($p < 0.001$).	N/A
Hicks et al. (2011)	• $n = 2$ middle school • ID • Age 14	Direct instruction using explicit, systematic, and scripted instruction	Grammar/Syntax	Use of prepositions in daily probes, instructional and generalization activities	Once/day 15 min	DI linked to steep increase in use and response to prepositions.	Maintenance with no clear generalization effect.
Hicks et al. (2015)	• $n = 3$, elementary school • Ages 8–10 • Moderate ID	Direct instruction using explicit, systematic, and scripted instruction	Grammar/Syntax	Use of prepositions in daily probes and generalization activities	12 weeks Once/day 6 min	Use and response to prepositions learned.	Maintenance of skills 8 weeks. Generalization to untaught activities
Li et al. (2021)	• $n = 3$, 6th-grade • Mild ID & DS	Story retelling using Story Hand	Narration	Story grammar complexity, cohesion, mean MLU and NDW	10–14 sessions 30–35 min	Moderate to high effects in SG-complexity, MLU-M, NDW. Limited gains in narrative cohesion.	High level maintenance for one month with independent use of StoryHand.

(Continued)

TABLE 2 (Continued)

Studies	Participants	Intervention	Oral language area	Outcome measures	Dosage	Effects	Transfer
McGuire (2014)	• $n = 10$ special educators • Moderate–severe IDD • Preschool-adult life skills classes	Educational oral language tools and methods	Phonology Vocabulary Grammar/Syntax	Teacher-reported tools and methods for oral language instruction (qualitative)	N/A	N/A	N/A
Mims et al. (2012)	• $n = 14$, middle school students • 9 with autism • 1 mild ID • 4 moderate ID	Direct instruction on literacy	Vocabulary	Vocabulary, comprehension, familiar text, unfamiliar text, poetry, research and writing	8 lessons in one unit 5 school days/lesson	Significant gains for vocabulary ($d = 1.31$, $p = 0.005$).	N/A
Næss et al. (2022)	• $n = 103$ • DS • 1st grade • Mean CA = 76.61 months, SD = 5.14 • MA in months = 77.47, SD = 5.66	DSL+ vocabulary intervention program	Vocabulary	Expressive and receptive vocabulary and breadth, receptive vocabulary depth, receptive grammar	15 weeks Daily sessions 15 min	Trained vocabulary was learnt. Significant effect in receptive and expressive measures ($d = 0.429$). No significant progress in vocabulary depth	No significant transfer effects.
O'Connor and Stagnitti (2011)	• $n = 35$ • ages 5; 0–7; 6 • ID, DS, DD, ASD	"Learn to Play" play intervention	Grammar/Syntax	Play skills, receptive and expressive language	6 months Twice/week 6 months	Small effect on play scores and language skills.	No transfer effects
Pattison and Robertson (2016)	• $n = 1$, 4th grade • 9;8 years • ID (NVIQ 74) • Language delay	Vocal imitation, sign language communication, simultaneous communication	Grammar/Syntax	Unprompted and prompted MLU in the three conditions	15 sessions 1 session/day 30 min	Higher MLU. Simultaneous communication was the most effective prompt.	N/A
Van Der Schuit et al. (2010)	• $n = 10$, preschool children • Ages 2–6 • ID	"Learn to Play" Early intervention program	Vocabulary	Receptive and expressive language, nonverbal intelligence	2 years 9-week cycles 5 times/week 2.5–3 h/day	Significant progress in expressive language. Trend towards progress in expressive syntax. Progress in expressive vocabulary ($p = 0.043$, $d = 1.57$)	No significant transfer to standardized measures

($p = 0.005$) and overall literacy skills. However, the study lacked a comparison group, limiting generalization of the results, and the session duration was deemed too taxing on many participants' attention span.

Similarly, Burgoyne et al. (2012) conducted a randomized controlled trial for primary school children with Down Syndrome, using a reading and language intervention with two strands. The language strand, based on the multiple context approach, employed visual supports and simple games (e.g., matching and sorting) to teach expressive vocabulary in themes. Although significant progress in reading and taught expressive vocabulary was evidenced, effect sizes were only small to medium and no transfer to other measures of literacy nor standardized tests of language was observed. The gains were however maintained in taught vocabulary when instruction moved to a different set of words.

The third study focuses on an early intervention program for preschool children with intellectual disabilities, to improve early language, communication, and emergent literacy skills (Van Der Schuit et al., 2010). The Kids Learning to take Initiatives in communication program (KLINc) uses a play and learning

environment and multimodal language representations (e.g., manual and tactile sign systems, graphic symbols, digital and synthesized speech output, photographs, etc.). It involves activities chosen and/or initiated by the child, organized in a 9 weeks cycle around a core theme in line with the child's zone of proximal development, varying in complexity and skills (e.g., vocabulary, phonemic awareness, story comprehension). The main goal is to develop children's knowledge and networks of concepts and words through multiple and repeated experiences, including at home with the parents' collaboration. For progress tracking, dynamic assessment protocols are used during the intervention to adjust goals, better individualize each child's learning contexts and means, and to further involve parents in the process. This intervention was conducted on a small sample ($n = 10$) but was demonstrated effective ($p = 0.043$) in developing children with IDD's receptive and expressive vocabulary.

The randomized control trial of the Digital Down Syndrome LanguagePlus (DSL+) vocabulary intervention for 1st-grade children with Down Syndrome by Næss et al. (2022) also evidenced a significant effect on trained expressive and receptive vocabulary. DSL+ uses digital material to develop vocabulary in terms of breadth and depth, in order to improve children's language skills. It is based on the lexical quality hypothesis using an explicit systematic didactic approach with repeated exposure to a word and connections with the child's experiences, as well as dialogic interaction through picture book-sharing, combined with an implicit approach of learning through multiple multimodal encounters of words. The intervention delivery program is organized in daily 15 min sessions divided into 4 weeks cycles, each week introducing a new word, and progressing from individual, to small groups with children from mainstream classrooms, to finally whole-group mainstream classroom. While DSL+ was effective in teaching trained vocabulary, significantly increasing receptive and expressive measures, it did not show any significant progress in vocabulary depth or transfer effects to standardized measures of vocabulary and grammar. Maintenance and long-term effects were also not assessed by the authors.

Alternatively, McGuire (2014) interviewed special education teachers of children with moderate to severe intellectual disabilities, revealing their vocabulary development practices. According to this study, teachers teach vocabulary in themes and various contexts, through natural conversations using repetition, and emphasizing new words and definitions. Board games, such as memory games and matching, are also used to train new vocabulary. Shared book reading is employed to teach and reinforce vocabulary in decontextualized settings. Teachers also use multimodal presentation (e.g., verbal presentation combined with images) and track progress during everyday conversations, tasks, and targeted activities.

Finally, Dusseaux (2018) conducted a study on special educators' use of echo-album with students with IDD, which also focused on vocabulary acquisition and learning. Indeed, teachers in this study reportedly utilized the album to develop and activate new vocabulary, employing strategies such as multimodal presentation of words using Makaton signs, mimes, and photos as well as repetition and recast strategies.

Grammar/syntax

Several studies in our sample focused on oral grammar, syntax, or morphosyntax areas of language in children with IDD, using varied intervention approaches. In the first study, Baxter et al. (2022) conducted an intervention on the use of regular past tense forms by elementary school students with Down Syndrome, via the Past Tense Intervention (PaTI) program contrasting the regular past tense morphemes with the present continuous. The intervention was implemented by trained teaching assistants equipped with scripted lessons, during daily 20 min sessions. Different strategies were used such as modeling targets in context, recasts, multiple repetitions of target structures, text to support learning, comprehension, and memory as well as explicit instruction of grammatical rules. This study succeeded in showing that grammatical morphemes and expressive morphosyntax can be effectively learned, used, and generalized by children with Down Syndrome, when directly taught in a relatively short time (10 weeks). Significant gains were observed on all measures ($p < 0.005$), with a notable increase in overregularization errors, indicating effective teaching of regular past tense forms. Moreover, gains on the regular simple past tense use had a very large effect size ($d = 3.12$) and the effects of the intervention were maintained 12 to 14 weeks post-intervention, with the generalization of taught simple past tense rule to untaught verbs. However, the intervention's effect did not transfer to the other measures of expressive grammar.

Other studies, such as those by Hicks et al. (2011, 2015), also targeted specific aspects of morphosyntax. The interventions focused on receptive and expressive use of spatial prepositions in middle school children with IDD. Special educators delivered direct instruction using explicit systematic and scripted lessons, dividing the intervention into four phases for each preposition. Teachers used modeling of examples and non-examples, through demonstration via manipulation of objects, to teach a preposition before testing the participant on the different examples. Generalization was assessed during book-reading activities and a scavenger hunt. Despite the limited sample sizes and the lack of long-term effect tracking, intervention effects were shown to be promising. For instance, in the first study, direct instruction led to a steep increase and maintenance of the use and response to prepositions (Hicks et al., 2011). The second study demonstrated effective learning of the prepositions, maintenance for up to 8 weeks, and generalization to untaught activities (Hicks et al., 2015).

Additionally, Dusseaux (2018) reported on special education teachers' practices for developing morphosyntactic skills in students with moderate to severe intellectual disabilities. Teachers expressed specific difficulties and a lack of tools and materials dedicated to morphosyntactic language instruction, as they incorporate morphosyntactic instruction into daily activities, exchanges, and storybook reading. For instance, correct sentence structures are targeted using visual support and cues such as images and Velcro bands representing each component of the sentence. Correct syntax is also modelled through play-based activities, such as puppets and pretend play. During the activities, strategies such as recasting, modeling, and prompting questions are employed to structure students' sentences and complexify utterances. Progress in this area is reportedly assessed through the mean length of utterances and the number of different words produced by students.

In contrast, some interventions focused on developing expressive language in a more general sense or solely through MLU training and measures. For example, Pattison and Robertson (2016) conducted an intervention on an elementary school student with IDD in a whole-group class, based on three communication strategies randomly selected each day: vocal imitation prompts, sign language prompts,

and simultaneous communication prompts. Despite being a single-case study, all prompts were found to be effective at increasing the participant's MLU, with simultaneous communication (combination of verbal and sign prompts) being the most effective. On the other hand, O'Connor and Stagnitti (2011) conducted a play-based intervention in a specialist school in children with intellectual and developmental disabilities. The "Learn to play" intervention aims to develop pretend play skills such as doll play, construction, transport, and home play sequences with adults guiding the children in their play. Results revealed higher play scores and language skills, as well as significant improvement in social interaction with the use of visual cues increasing language ability and language scores. However, expressive communication scores have not significantly progressed ($p = 0.500$). Furthermore, McGuire (2014) reported on the aspects of the echo album as a means of developing syntactic and morphosyntactic abilities in children with intellectual disabilities. Teachers reportedly use this tool to facilitate correct production of organized syntactic structures that include a subject, a verb, and an object. They employ strategies such as modeling, recasting, guided questions, repetitions, and manual signs to encourage correct production. Moreover, this tool is utilized to enhance the complexity of students' utterances in terms of vocabulary and sentence structure. Some teachers even introduce a starting word or group of words to encourage the use of more complex structures and diversify vocabulary. Echo albums can also be used for priming pronouns and prepositions usage. Teachers model sentences containing the target pronoun or proposition before asking the students to describe the pictures, implicitly prompting the production of the target pronoun. The same strategies mentioned earlier, including verbal and visual cues, are employed to support the acquisition of correct sentence structures and morphemes.

Finally, other studies effectively targeted expressive morphosyntax as part of narrative interventions developing language skills related to narration and story-telling, on the micro and macrostructural levels.

Narration

One narrative intervention study utilizes the colorful semantics approach to teach narrative skills to elementary and middle school children with mild to moderate intellectual disabilities (Hettiarachchi, 2016). The approach focuses on syntactic structure development using a color-coding system to enhance comprehension and response to "wh" questions. Visual and auditory support, such as gestural Makaton cues, is used to reduce memory load. The sessions were conducted for 6 weeks bi-weekly in whole-class groups by a trained teacher. Games and narrative tasks were also incorporated in the intervention. Although a significant increase in the use of complex or compound structures among participants with ID was shown in post-test, this study has several limitations, such as the lack of a control group and the lack of any spontaneous language sample to generalize results.

Furthermore, Li et al. (2021) used a video-based story-retelling instruction method based on a visual support tool "Story Hand," aiming to improve narrative abilities of children with mild intellectual disabilities and Down Syndrome. Story Hand is a multisensory learning strategy, visually displaying the main information and elements in a narrative story on the child's hand, helping with the memorization and recalling of the story macrostructure. In the study, the intervention was conducted in three stages divided in 10 to 14 35 min sessions, starting with the video-based story retelling instruction, an explanation of the story grammar (SG) elements represented by Story Hand, the analysis of SG elements in the video, retelling with modeling and support, and independent retelling. In the second phase, implementers incorporated extended conversations to discuss the content of the story. The main prompting strategy was recast, along with turn-taking and shared control, to improve microstructural elements and extend the participants' sentence productions. Lastly, students practiced independent story retelling. This intervention was demonstrated to be effective, as moderate to high effects were evidenced on the SG complexity, MLU, and number of different words used among the participants. MLU in the whole participant group increased significantly, especially in the older participants, with a significant increase in the use of complex or compound structures among participants with ID ($p < 0.001$). The results were maintained at a high level for up to 1 month, and the participants appeared to independently use the Story Hand strategy after the intervention ended.

Bunning et al. (2017) conducted a study on storytelling and narrative skills in adolescents with intellectual disabilities using a systematic, collaborative approach and conversational strategies incorporated into the "Storysharing" intervention. The intervention involved 15 weeks of once-weekly group sessions lasting an hour and a half. Participants shared personal stories and applied Storysharing strategies in dyads, such as active listening, flow, rhythm, musicality, and modeling of storytelling techniques using multimodal communication. Although the study showed improvement in topic maintenance, there were no observed changes in discourse abilities. It is also important to note that the study had a small sample size and lacked a control condition. Therefore, the generalizability of the results to a whole-group class led by a teacher may be limited.

Discussion

The purpose of this review was to identify teaching practices in oral language intervention and instruction for students with intellectual developmental disabilities in educational settings. Additionally, we aimed to highlight the outcomes of these interventions to gain a thorough understanding of the practices and the contributing factors to their effectiveness in this population. In the following section, we elaborate on the research questions that guided our review, based on our findings.

The first research question intended to report on the existing oral language interventions for students with IDD. After analyzing the selected studies, we were able to gather thirteen educational interventions, within fourteen studies ($n = 14$), including two studies stemming from gray literature, with oral language outcomes in the areas of speech, vocabulary, morphosyntax, and narration. Participants profiles varied in cognitive skills, age, grade, and IDD severity. Down Syndrome was the only mentioned genetic IDD etiology, which can be explained by the fact that DS is the most common genetic cause of IDD and thus tends to be the most studied group in the population. While the diverse participant samples across the studies accurately represent the heterogeneity found in the IDD population, it is difficult to use them to compare and specifically determine the effectiveness of the suggested interventions. On the other hand, interventions targeted all areas of expressive language, but phonology/speech was the least studied component, mentioned only in two studies as a secondary

outcome or in spontaneous unplanned activities (McGuire, 2014; Dusseaux, 2018). As mentioned in McGuire's study, this could be due to teachers relying on speech-language therapists to train this language component (McGuire, 2014). In contrast, morphosyntax was the most targeted in the selected studies. These interventions included training of overall expressive language, increasing MLU, and instruction on two specific types of morphemes (prepositions and past tense forms) in syntactic structure. Interestingly, only three different interventions in four of the studies (Hicks et al., 2011, 2015; Pattison and Robertson, 2016; Baxter et al., 2022) specifically targeted morphosyntactic skills in children aged from 7 to 14 years old. In addition, in one study, teachers suggested that they tend to work on this language component on a day-to-day basis, in a spontaneous and contextualized manner through book-reading, natural conversations and exchanges, and play-based activities, with little to no planning, as they expressed difficulties in targeting this language area, and a lack of specific tools and materials dedicated to morphosyntactic development (McGuire, 2014). This could explain the number of studies aiming to improve the information base available to teachers in the area of morphosyntactic instruction. However, in this review, no study reported on interventions designed to systematically train, in a gradual developmental perspective, morphosyntactic skills of students with IDD, leaving teachers with a growing, but limited amount of method options and tools to effectively develop morphosyntax throughout the child with IDD's academic years, despite being a language component severely and persistently altered in this population. Regarding vocabulary, two interventions relied on a literacy approach to develop vocabulary among other oral and written language skills in children with DS and mild to moderate intellectual disability (Burgoyne et al., 2012; Mims et al., 2012), as literacy and oral language skills are closely linked and tend to be developed simultaneously in school. Only one study attempted to develop an evidence-based intervention using a systematic approach, specifically designed for the improvement of the expressive and receptive vocabulary of 1st grade students with Down Syndrome, further demonstrating the lack of EBP educational methods which teachers can use to effectively teach oral language components to children with IDD (Næss et al., 2022). Finally, narration was used as a means to train oral language in three different studies among older students with IDD (ages 11 to 16 years), as micro and macrostructural skills are trained by educators through improving topic maintenance, story structure, MLU, and number and different words used (Hettiarachchi, 2016; Bunning et al., 2017; Li et al., 2021). One study aiming to develop oral narrative skills included a younger group of students, aged from 3 to 5 years old (Hettiarachchi, 2016). Once again, these results reflect the paucity of studied interventions designed to develop oral language interventions for students with IDD.

Next, we aimed to explore the effectiveness of these interventions, in terms of outcomes, maintenance of gains, and generalization. Despite the many challenges of teaching students with IDD, all interventions from our studies were successful at teaching the targeted oral language components through their interventions, reinforcing the evidence around the possibility and necessity of effectively improving children with IDD's academic and cognitive skills, in line with the current literature (Van Der Schuit et al., 2011; Smith E. et al., 2020; Moraleda-Sepúlveda et al., 2022), as well as with the recent interest in the inclusion of this population in general education classrooms. In terms of maintenance and generalization, most studies did not report long-term measures, and most intervention gains did not transfer to standardized measures or functional skills. This is in line with evidence from the literature demonstrating poor transfer and generalization of new linguistic information in language disorders, namely developmental language disorders (see, e.g., Leroy et al., 2014). However, four studies evidenced maintenance and/or transfer of gains following the interventions phase (Burgoyne et al., 2012; Hicks et al., 2015; Li et al., 2021; Baxter et al., 2022), but rarely did they demonstrate maintenance on a longer-term nor did they show transfer to standardized measures of oral language. These explicit and systematic interventions had the particularities of being intensive in dosage, contextualized (e.g., narration) as well as used multiple support methods. Thus, we took interest in exploring the elements contributing to the effectiveness, maintenance, and generalization of taught elements in oral language interventions for students with IDD.

After analyzing the interventions from the selected studies, we are able to extract key elements that seem to contribute to the success of the educational practices: dosage, means of presentation, and support methods. Indeed, studies with the most significant results and successful generalization relied on interventions with high frequency and/or intensity of input, as well as multimodal means of presentation of the target information (orally, with pictures, using objects, etc.), using multisensory support such as gestures and pictures to support the oral information being presented to the students. In fact, evidence shows that high frequency and high variability improve generalization (Bybee, 2010, cited in Krzemien et al., 2020).

Systematic instruction and support strategies alongside multimodal presentations were also implemented in most of the interventions such as recasts, repetition, modeling, and question prompts, in line with the EBP recommendations for effective interventions in this population, namely in the speech and language pathology interventions (e.g., Balthazar et al., 2020; Frizelle et al., 2021). Incidentally, these findings are also aligned with the principles of the universal design of learning (UDL) framework, based on a set of three principles (provide multiple means of representation, action, and expression, and provide multiple means of curriculum), (see, e.g., Capp, 2017; Rao et al., 2017). However, as mentioned above, transfer and generalization to standardized measures of oral language was not present in most studies demonstrating significant results following the explicit interventions, mainly because of their cognitive limitations. Nonetheless, this raises the question of the actual effectiveness of exclusively explicit and systematic methods of instruction in the development of oral language in children with intellectual disabilities, if evidence rarely shows a modification of language behaviors on standardized tests. In fact, several studies have evidenced transfer and generalization of oral language skills, most notably on expressive language and sentence production, following implicit interventions based on high variability and frequency of input presentation in school-aged children with language impairments (e.g., Krzemien et al., 2020), as well as tasks based on implicit learning mechanisms such as syntactic priming tasks (e.g., Bourdin and Leuwers, 2020; see also Branigan and Messenger, 2016). In addition, in the area of intellectual disability, implicit learning was demonstrated to be effective and independent of IQ and age (Reber, 1993, as cited in Vinter and Detable, 2003), which could constitute an avenue to explore in the elaboration of adapted tools and teaching methods of oral language in students with intellectual disability.

Finally, limitations of the studies in our sample were multiple. Many studies had a very small number of participants, limiting the generalizability of intervention effects. The samples were very diverse in

terms of population characteristics, limiting the possibility to compare the effectiveness of the selected interventions. The studies also lacked measures of social validity of the interventions, as it is only included in three of the studies (Hicks et al., 2011, 2015; Li et al., 2021), despite it being important to include and rely on educators' input while developing an intervention or educational tool, as they should be able to deem it functional and accessible to use in class and as part of the curriculum. Lastly, we chose to include gray literature in our selection criteria in order to further broaden our scope of studies reporting on oral language interventions for children with IDD in educational settings, which resulted in the selection of two studies, based on qualitative outcomes, incomparable to the quantitative intervention outcomes and measures included in the rest of the studies in our sample.

Implication for research and practice

Findings from this review provide new insight into the range of oral language interventions that have been evaluated and/or reported within school settings, from which teachers can draw upon to implement in their classrooms, depending on their students' needs. However, results also evidenced the limited body of literature dedicated to elaborating and reporting on comparable high-quality, evidence-based, or research-based interventions and their effectiveness for the development of oral language skills in students with IDD. Additionally, as our results suggest poor evidence on the effectiveness of educational practices based on explicit intervention strategies, researchers and professionals should rely on methods designed to relieve students from the constraints of cognitive load, such as short-term memory limitations, namely using implicit learning methods, in order to increase the effectiveness of their interventions.

Hence, these findings highlight the urgent need to compensate for the gap and respond to teachers' needs by providing effective evidence-based interventions and tools specifically designed to improve oral language outcomes in this population, using effective EBP methods and support strategies, and providing training for educators on the intervention tools. This is especially important in light of the current challenges regarding access to speech-language therapy services. Indeed, in European countries such as France, due to the saturation of SLT clinics with waiting periods of up to years, as well as medical deserts in rural areas, effective intervention on language in the school setting is of utmost importance for better developmental and learning outcomes. Furthermore, collaboration with parents and caregivers of students should be practiced during oral language interventions, as transfer and generalization are enhanced when abilities are practiced and invested in different contexts. Finally, with the growing trend towards the inclusion of students with IDD in mainstream and general education classrooms, researchers and practitioners need to use global, inclusive, and individualized frameworks in elaborating oral language teaching tools and interventions, in order to best cater to the ever-growing heterogeneity of students' profiles and their highly intensive and variable needs in the classrooms.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

CJ: Writing – original draft, Writing – review & editing. LI: Writing – review & editing. BB: Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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