DEVELOPMENTAL DYSPHASIA AND SENSORINEURAL HEARING LOSS: A CASE STUDY OF MULTIDISCIPLINARY INTERVENTION IN SCHOOL-AGED CHILD

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DOI: 10.21062/edp.2025.004

Abstract

Developmental dysphasia, also known as developmental language disorder, is a prevalent neurodevelopmental condition that significantly impacts language acquisition, academic achievement, and social functioning. This article presents a case study of an 8.7-year-old pupil with mixed developmental dysphasia and mild bilateral sensorineural hearing loss. Comprehensive psychological, special-educational, and otorhinolaryngological assessments revealed marked deficits in verbal comprehension, phonological processing, and executive functions, contrasting with preserved nonverbal intelligence. The findings demonstrate how even mild perceptual hearing loss may intensify language impairment, compromise literacy acquisition, and hinder classroom adaptation. The case highlights the necessity of a multidisciplinary intervention strategy integrating speech-language therapy, special-educational support, pedagogical adaptation, and family involvement. Targeted activities focused on phonological awareness, auditory and visual discrimination, and working memory, combined with structured teaching and multimodal cues, proved essential. The study emphasizes that early and intensive intervention can significantly improve developmental outcomes, while prognosis remains dependent on impairment severity, comorbidities, and sustained professional collaboration.

Keywords: developmental dysphasia, developmental language disorder, sensorineural hearing loss, executive functions, phonological awareness, case study, multidisciplinary intervention

INTRODUCTION

Developmental dysphasia (also referred to as *specific developmental language disorder*[1]) is a complex neurodevelopmental condition that substantially affects the acquisition of language abilities in children, despite intact hearing, average intelligence, and favorable socio-environmental circumstances (Petrović et al., 2023). Core manifestations typically include delayed speech onset, impaired comprehension and expression, grammatical difficulties, and restricted vocabulary (Rapin et al., 1992; Bojanin, 1985). Epidemiological data suggest that specific language disorders occur in 5–7% of the child population, with developmental dysphasia accounting for approximately 2–3% (Krstić, 2002). Tomblin et al. (1997) reported that about 7% of children aged five to six years demonstrate significant language difficulties, whereas data from the Institute of Mental Health in Belgrade indicate that up to 14% of children aged three to seven years were diagnosed with developmental dysphasia (Aleksić et al., 2002). Prevalence rates vary depending on diagnostic criteria and access to care, and some cases remain undetected for extended periods (Kašić, 2002). Importantly, the language impairment is not attributable to sensory or intellectual deficits, but rather to disruptions in the processing of linguistic stimuli at the level of the central nervous system (Enderby & Emerson, 1996). Children with developmental dysphasia frequently present difficulties not only in phonological development but also in morphology, syntax, and pragmatics (Lazarević, 2010). Rapin and Allen (1983) distinguished several subtypes based on the predominant symptoms, including expressive, receptive, and mixed forms. Differential diagnosis is a critical issue, particularly in distinguishing developmental dysphasia from other neurodevelopmental disorders. For instance, children with autism spectrum disorders also display delayed speech development, but this is accompanied by additional behavioral and socio-communicative features (Kačić et al., 2011). In contrast, children with developmental dysphasia typically show language-specific deficits while preserving nonverbal cognitive abilities (Petrović et al., 2023). Their cognitive profile is often uneven: nonverbal intelligence generally falls within the normal range, whereas language skills lag significantly behind, with marked consequences for academic achievement and peer interaction (Tadić et al., 2015).

Longitudinal research indicates that difficulties may persist into adulthood, particularly in the absence of timely and intensive intervention (Vuković, 2015). The impact of developmental dysphasia extends beyond the child to the family context. Parents frequently experience elevated levels of stress and emotional burden. Petrović et al. (2023) documented that while parental involvement is typically high, many caregivers report symptoms of emotional exhaustion. Parental self-concept has been found to correlate with the child's sensory characteristics, especially impairments in proprioception and atypical behavioral responses to stimuli (Petrović et al., 2023). In recent years, increasing attention has been paid to sensory processing as a relevant dimension influencing the clinical presentation of developmental dysphasia. Associations between sensory processing difficulties and language development have been confirmed in children aged three to six years (Petrović et al., 2023; Dunn, 2007). Such children may exhibit avoidant, hyperreactive, or under-responsive behaviors to everyday stimuli, with implications for adaptation and communication (Ben-Sasson et al., 2009). A comprehensive, multidisciplinary approach is essential for accurate diagnosis. Assessment typically includes standardized language testing, evaluation of the sensory profile, and cognitive assessment (Gillberg, 2010). In selected cases, neuroimaging techniques are employed to detect subtle abnormalities in brain regions implicated in language processing (Krupa-Ćaćić & Glumbić, 2023). Intervention strategies center on speech and language therapy targeting both receptive and expressive skills and may be supplemented by sensorimotor activities aimed at enhancing attentional control and responsiveness to stimuli (Vujović, 2021).

[1] Developmental speech or language disorders arise during the developmental period and are characterized by difficulties in understanding, producing speech, acquiring language, or using language contextually for communication purposes that are beyond the normal range of variation expected for age and intellectual functioning (ICD-11). Developmental language disorder with receptive and expressive language impairment is characterized by persistent difficulties in acquiring, understanding, producing, and using language that arise during the developmental period, usually in early childhood, and cause significant limitations in the individual's ability to communicate. The ability to understand spoken or sign language (i.e., receptive language) is significantly below the expected level for the individual's age and intellectual functioning (ICD-11).

The effectiveness of intervention is closely linked to its early initiation and intensity (Šćepanović & Vujačić, 2016). Prognosis is heterogeneous: while some children achieve marked improvements through intensive support, others continue to experience language-related difficulties into school years and adulthood, particularly in written expression and social communication (Bishop et al., 2017). Successful outcomes are strongly influenced by the level of support provided by families, educators, and professionals (Zorić et al., 2021).

CASE STUDY

An 8.7-year-old boy, a second-grade primary school pupil, underwent repeated psychological and subsequently otorhinolaryngological examinations due to persistent difficulties in academic performance, attention, processing of verbal instructions, and perceptual functions. The referral was initiated both by the school and the mother, who reported long-term problems with concentration, working memory, comprehension of tasks, and slow working pace. Developmental history indicated that the boy was born at term through spontaneous delivery, with normal neonatal adaptation. He achieved developmental milestones, such as sitting, walking, and speech, within the expected range. Family history is significantly burdened, as the mother had a past history of drug addiction, representing a serious perinatal and psychosocial risk factor, although prenatal exposure to toxic substances was not explicitly confirmed. Learning difficulties and neurodevelopmental deviations are present within the extended family. The child is currently raised in a stabilized home environment, though the mother reports a need for more intensive support with homework and preparation. At the first psychological assessment in January 2024, the standardized WISC-V test was administered, revealing overall intellectual functioning at the borderline of the low-average range (FSIQ 80). The profile was markedly uneven, with values in verbal comprehension, vocabulary, and language processing well below the population mean, while nonverbal components such as visual-spatial reasoning and fluid intelligence were at the lower limit of the normative range. Working memory and executive functions were weakened, particularly in selective attention, activity regulation, and processing of multistep instructions. Emotional functioning was within normal limits, but under higher cognitive load, the child displayed accelerated frustration and a tendency to give up challenging tasks prematurely. The conclusion of the assessment was developmental language disorder – mixed developmental dysphasia, with deficits equally present in both expressive and receptive components. This conclusion was confirmed by a clinical speech and language therapist, under whose care the boy continues. A follow-up examination in March 2025 revealed mild improvement in verbal expression, although deficits persisted in comprehension, phonological processing, and visual differentiation. The child continued to show difficulties in visual discrimination of details, exhibited signs of mild dysgraphia, and struggled with reading comprehension as well as tasks requiring sequential information processing. In the school environment, he had difficulty adapting to changes in routine, required adult support, and needed frequent repetition of instructions. In addition to weakened executive and perceptual-cognitive functions, possible hearing loss was suspected, as the child often failed to respond to verbal cues, confused phonemes, and underperformed in tasks requiring accurate phonemic analysis. ENT examination in November 2025 confirmed bilateral mild sensorineural hearing loss, most pronounced at higher frequencies (2–4 kHz).

This impairment may significantly affect consonant perception, phonological differentiation, and language development. Tympanometry was normal, with no signs of acute or chronic middle ear pathology. From an ENT perspective, immediate hearing-aid fitting was not indicated; however, regular monitoring was recommended, alongside acoustic optimization of the classroom environment (noise reduction, proximity to the teacher) and the preferential use of visual cues during instruction. Special-educational assessment confirmed persistent deficits in both expressive and receptive language components. The boy's speech was at times difficult to understand, with word distortions, inconsistent articulation, dysgrammatisms, and articulatory clumsiness. Specific assimilations and reduced linguistic sensitivity were evident. Vocabulary remained below age level, and verbal fluency was weakened.

Speech comprehension was imprecise, task comprehension was low, and instructions had to be repeated. Verbal-auditory memory was significantly impaired, as the child was unable to retain sequences of instructions, requiring individual guidance. Auditory analysis and synthesis were underdeveloped, phonological manipulation was limited, and the acquisition of literacy skills was problematic. An integrated interpretation of psychological and somatic findings indicates that the boy is facing multiple disadvantages affecting perceptual, executive, and language-cognitive domains. The developmental difficulties are most likely the result of an interplay of biological, psychosocial, and environmental factors. The presence of mild hearing loss may have a long-term negative effect on comprehension of instructions, language performance, and social interaction. Based on these findings, level 3 supportive measures were recommended in accordance with Decree No. 27/2016 Coll., including the support of a teaching assistant, regular special-educational interventions focused on phonemic awareness, visual discrimination, and working memory, continued speech therapy, and classroom adaptations such as structured teaching and the use of multimodal cues. The child benefits from direct support, smaller task steps, and frequent positive feedback. Continued ENT monitoring was advised, with consideration of hearing compensation in the event of further deterioration. The future prognosis will depend on the timeliness, continuity, and comprehensiveness of support across family, school, and healthcare settings, with partial progress expected particularly in nonverbal domains and in compensatory strategies for weakened functions.

CLINICAL INTERVENTION

The primary goal of the intervention is to strengthen key perceptual-cognitive functions (phonemic awareness, auditory and visual discrimination, working memory), to compensate for the language deficit partly resulting from mild sensorineural hearing loss, and to improve comprehension of spoken language. The intervention also includes targeted adaptation of the educational environment, enabling the pupil to participate more effectively in instruction. To achieve this, a comprehensive intervention is implemented, involving regular speech therapy, special-educational activities, and, if necessary, psychological support. The intervention is carried out in close cooperation with the family and other professionals, with emphasis on an individualized approach.

Phonological awareness and auditory discrimination comprise systematic training in sound differentiation, the ability to identify phonemes within words, and comparison of phonetically similar expressions. The aim is to strengthen phonemic awareness as a fundamental prerequisite for reading, writing, and accurate pronunciation. Key elements of support include:

- Auditory analysis and synthesis of words – segmenting words into phonemes, blending phonemes into words, identifying initial and final sounds.
- Rhythm and intonation – clapping syllables, perceiving and reproducing rhythm, practicing intonation patterns.
- Visual supports – pictures, color coding, phoneme pictograms to reinforce sound–symbol associations.

Auditory memory and working memory focus on the ability to retain and reproduce linguistic units over a short time span. Emphasis is placed on combining verbal and nonverbal stimuli. Key elements of support include:

- Repetition of word and sentence sequences, memorization of instructions and procedures.
- Attention training during listening – use of visual cues to verify comprehension.
- Mental flexibility and planning – inclusion of mind maps, flow charts, and the use of tables and diagrams.

Visual discrimination and orientation serve as compensatory channels in cases of reduced auditory perception. This domain supports independence, comprehension, and fluent information processing. Key elements of support include:

- Differentiation of shapes, symbols, and letters; identifying differences and categorizing items.
- Work with picture sequences – comprehension of storylines, sequencing scenes, predicting meaning.
- Visual maps and organizers – supporting task orientation and structuring of information.

Verbal comprehension and language production focus on the quality of language expression, emphasizing grammatical structure, linguistic sensitivity, accuracy of pronunciation, and vocabulary development, including verbal fluency. It is recommended to maintain a concept diary jointly by the school and family to ensure consistent vocabulary. Key elements of support include:

- Comprehension of simple and complex instructions, recognition of key words in sentences.
- Pronunciation and articulation – practice of problematic phonemes (e.g., sibilants, L, R), correction of dyslalia.
- Vocabulary and sentence formation – activation of concepts, introduction of new words, and formulation of statements based on pictorial stimuli.

Attention and concentration training targets the ability to maintain focus for longer periods, shift attention effectively between tasks, and resist environmental distractions. Emphasis is also placed on self-regulation – the capacity to control behavior, attention, and impulses – and resilience to distraction, which is particularly critical in acoustically demanding school environments. Key elements of support include:

- Working in an environment with minimal visual and auditory distractions.
- Use of structured tasks with frequent changes in activity.
- Visual overviews and timelines.
- Movement breaks and relaxation exercises.
- Practice of routine activities, time and space organization.

Support in the school environment requires pedagogical strategies adapted to the needs of a child with hearing impairment. Key elements of support include:

- Structured teaching with visual and contextual supports – gestures, pictures, pictograms.
- Optimal seating arrangement – ideally the second row near a window to ensure visual contact with the teacher.
- Reduction of distractions – acoustic treatment, use of carpets, a quiet environment.
- Clear communication – appropriate speech tempo, emphasis on key words, comprehension checks (feedback), coordination of group communication.
- Substituting dictation with fill-in exercises, allowing the child to develop spelling skills without the burden of auditory perception – for example, selecting words from a list or completing prepared sentences.
- Enhancing verbal communication with visual supports (pictures, written words).

Family support and professional cooperation play a crucial role in the success of the intervention. Key elements of support include:

- Regular consultations and guided home preparation according to the school plan.
- A stable environment enabling the child to focus on rehabilitation and academic requirements.
- Coordination among professionals – the school and its counseling services, external educational counseling facilities, clinical speech therapist, and ENT specialists.

It is recommended to use a combination of visual, auditory, and tactile stimuli. Suitable tools include graphic organizers, pictorial diagrams, communication cards, and applications that develop phonological awareness (e.g., tablet-based educational apps). A system of positive reinforcement is essential – immediate feedback, praise, and visual tracking of progress. The intervention plan will be regularly evaluated by the school counseling service at three-month intervals. Results will serve as the basis for revising level 2 supportive measures and adjusting the intervention plan if necessary. In cooperation with the educational counseling facility and ENT specialists, auditory functions will be monitored, and if deterioration occurs, appropriate compensatory aids (hearing aids) will be provided.

DISCUSSION

The present findings underscore the complexity of developmental dysphasia, or specific language impairment (SLI), which remains one of the most prevalent developmental communication disorders in childhood. With prevalence estimates ranging from 5–7% in preschool populations (Ramarao et al., 2018; Bishop et al., 2017), the disorder represents a significant public health concern given its far-reaching consequences for academic and social development. A central issue highlighted in the literature is the discrepancy between the severity of linguistic impairments and the otherwise preserved hearing, intellectual capacity, and neurological integrity of affected children (Leonard, 2014; Sim & Lum, 2018). This paradox complicates both recognition and diagnosis, as the absence of broader cognitive deficits may delay referral and intervention. Furthermore, the heterogeneity of linguistic deficits – encompassing morphosyntactic weaknesses, phonological processing difficulties, and pragmatic limitations (Conti-Ramsden et al., 2012; Bishop & Hayiou-Thomas, 2008) – suggests that SLI is not a uniform disorder but rather a spectrum of interrelated impairments. Another challenge lies in the frequent under-identification of developmental dysphasia, particularly in children who develop compensatory strategies or in bilingual populations where typical developmental variations can obscure underlying difficulties (Ebert & Kohnert, 2011; Cleave et al., 2010). This diagnostic complexity emphasizes the importance of early and precise screening procedures. Recent advances in automated speech analysis, such as Mel-frequency cepstral coefficients (MFCC) combined with neural network-based classifiers (Ramarao et al., 2018; Shahnawazuddin et al., 2016), offer promising avenues for early detection, particularly in contexts with limited access to specialized clinicians. While such technologies cannot replace comprehensive clinical assessment, they may serve as valuable adjunct tools in large-scale screening or in resource-limited environments.

The academic and social implications of developmental dysphasia are considerable. Studies consistently demonstrate elevated risks of school failure and poor literacy outcomes (Conti-Ramsden et al., 2012; Catts et al., 2005). Since reading relies heavily on linguistic competencies, children with SLI often face a cumulative disadvantage that persists into adolescence and adulthood. Moreover, comorbidities such as attention deficits, learning disabilities, and sensory processing disorders (Norbury et al., 2016; Dockrell & Lindsay, 2008) further exacerbate developmental trajectories and complicate intervention planning. These findings reinforce the need for a multidimensional diagnostic framework that goes beyond language assessment alone. With regard to intervention, there is strong consensus that early and systematic support is crucial. Evidence indicates that targeted speech and language therapy can yield significant improvements, with treatment outcomes being closely tied to intensity, duration, and contextual support (Cirrin et al., 2010; Law et al., 2004). A multidisciplinary approach, incorporating speech-language therapists, educators, psychologists, and families, has been identified as the most effective strategy (Justice & Ezell, 2002; Dockrell & Lindsay, 2008). Parents, in particular, play an indispensable role by reinforcing language use in daily interactions and by motivating children to sustain practice (Rinaldi et al., 2021). Importantly, the scope of intervention should not be limited to language alone. Recent research highlights the role of executive functions, working memory, and socio-emotional skills in shaping both the expression and the consequences of developmental dysphasia (Ebert & Kohnert, 2011; Henry et al., 2012). This suggests that interventions targeting these broader cognitive and emotional domains may enhance long-term outcomes.

In line with this, the integration of multimodal technologies, intelligent classroom environments, and automated monitoring systems has been proposed as a means of personalizing instruction and improving risk detection (Ramarao et al., 2018; Grataloup et al., 2022). Nevertheless, despite technological progress and growing scientific understanding, the cornerstone of effective support remains the early recognition of symptoms and the professional preparedness of clinicians and educators. Without timely identification and coordinated intervention beginning in the preschool years, children with developmental dysphasia are at substantial risk of experiencing persistent difficulties in both academic achievement and social integration.

CONCLUSION

Developmental dysphasia, also referred to as developmental language disorder, is a complex neurodevelopmental condition with a wide range of manifestations that extend beyond language to include cognitive functioning, academic performance, and children's social relationships. Although children with developmental dysphasia typically demonstrate preserved nonverbal intelligence and, in most cases, intact auditory organs, their ability to comprehend and use language is significantly impaired. These difficulties are often compounded by additional vulnerabilities, such as deficits in attention, executive functions, or sensory processing. The presented case of an 8-year-7-month-old boy illustrates the multifaceted nature of these challenges within the school context. The identification of mild sensorineural hearing loss further complicates language processing and underscores the need for a coordinated, multidisciplinary professional approach. Consequently, the intervention plan extends beyond speech and language therapy and special-educational support to include modifications of the learning environment and targeted reinforcement of executive functions. Central to this approach is the emphasis on individualized support and close collaboration among the family, school, educational counseling services, and healthcare professionals. Both empirical research and case-based evidence consistently indicate that intensive, targeted, and timely intervention can lead to substantial progress in language development and school functioning. Nevertheless, the prognosis for children with developmental dysphasia remains highly variable and is influenced by multiple factors, including the severity of impairment, availability of care, the extent of social and family support, and the presence of comorbid conditions. For this reason, it is essential to maintain a comprehensive and long-term approach that flexibly adapts to the evolving needs of the child and their environment. Looking ahead, further research is needed to clarify the interaction between linguistic deficits, executive dysfunction, and sensory processing difficulties, as well as to evaluate the effectiveness of multimodal interventions combining traditional speech-language therapy with technology-enhanced methods. Large-scale longitudinal studies would provide valuable insight into developmental trajectories and help identify protective factors that foster resilience. At the same time, educational policy should prioritize early screening programs, systematic training of teachers and clinicians, and accessible multidisciplinary support systems to ensure that children with developmental dysphasia are identified and supported as early as possible.

ACKNOWLEDGEMENTS

Open Access funding enabled and organized by Faculty of Health Studie, J. E. Purkyně University in Ústí nad Labem

CONFLICT OF INTEREST STATEMENT

No potential conflict of interest was reported by the authors.

ETHICS STATEMENT

All legal guardian/parents gave their informed consent for inclusion before their children participated in the study. All procedures performed in the study complied with the ethical principles for medical research involving human participants of the 1964 WMA Declaration of Helsinki and its subsequent amendments.

CONSENT

All legal guardian/parents gave their informed consent for inclusion before their children participated in the study.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are not publicly available due to ethical and legal restrictions concerning the protection of minors and the anonymized nature of the dataset. Given the sensitive nature of the information collected and the terms of consent obtained from participants and their legal guardians, data sharing is not permitted. Further inquiries regarding the study design and measures used may be directed to the corresponding author.

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