Clinical Practice Guideline

Interventions for Developmental Language Delay and Disorders

Katrin Neumann, Christina Kauschke, Annette Fox-Boyer, Carina Lüke, Stephan Sallat, Christiane Kiese-Himm

Department of Phoniatrics and Pediatric Audiology, University Hospital of Muenster, University of Muenster, Germany: Prof. Dr. med. Katrin Neumann, Prof. Dr. rer. nat. Dipl.-Psych. Christiane Kiese-Himmel

Department of German Linguistics, Clinical Linguistics, University of Marburg, Marburg, Germany: Prof. Dr. phil. Christina Kauschke

Institute of Health Sciences, University of Luebeck, Germany: PD Dr. Annette Fox-Boyer, PhD

Special Education and Therapy in Language and Communication Disorders, University of Wuerzburg, Germany: Prof. Dr. phil. Carina Lüke

Department of Pedagogy for Speech and Communication Disorders, Halle, Germany: Prof. Dr. phil. Stephan Sallat

Summary

Background: Approximately 9.9 % of children present with difficulties in language development (DLD), 7.6 % without serious additional impairments and 2.3 % associated with language-relevant comorbidities, e.g., hearing loss. Notably, in a consensus statement by experts in German-speaking countries, in the guideline presented here, and further in this article, all of these disorders are referred to as "developmental language disorders" (DLD), whereas the international consortium CATALISE only refers to those without comorbidities as DLD. DLDs are among the most commonly treated childhood disorders and, if persistent, often reduce educational and socio-economic outcome. Children in their third year of life with developmental language delay (late talkers, LT) are at risk of a later DLD.

Methods: This German interdisciplinary clinical practice guideline reflects current knowledge regarding evidence-based interventions for developmental language delay and disorders. A systematic literature review was conducted on the effectiveness of interventions for DLD

Results: The guideline recommends parent training (Hedges g = 0.38 to 0.82) for LTs with expressive language delay, language therapy (Cohen's d = –0.20 to 0.90) for LTs with additional receptive language delay or further DLD risk factors, phonological or integrated phonological treatment methods (Cohen's d = 0.89 to 1.04) for phonological speech sound disorders (SSDs), a motor approach for isolated phonetic SSDs (non-DLD), and for lexical-semantic and morpho-syntactic impairments combinations of implicit and explicit intervention approaches (including input enrichment, modeling techniques, elicitation methods, creation of production opportunities, metalinguistic-approaches, visualizations; Cohen's d = 0.89–1.04). Recommendations were also made for DLD associated
with pragmatic-communicative impairment, bi-/multilingualism, hearing loss, intellectual disability, autism-spectrum disorders, selective mutism, language-relevant syndromes or multiple disabilities, and for intensive inpatient language rehabilitation.

Conclusion: Early parent- and child-centered speech and language intervention implementing evidence-based intervention approaches, frequency, and settings, combined with educational language support, can improve the effectiveness of management of developmental language delay and disorders.

Cite this as:
Neumann K, Kauschke C, Fox-Boyer A, Lüke C, Sallat S, Kiese-Himmel C: Clinical practice guideline: Interventions for developmental language delay and disorders. Dtsch Arztebl Int 2024; 121: 155–62.
DOI: 10.3238/arztebl.m2024.0004

Approximately 9.9% of children present with difficulties in language development (1), making these among the most common and most frequently treated childhood disorders. Around 9% of all girls and 14.3% of boys insured by Germany's largest health insurance company currently receive speech-language therapy, mostly between the ages of 5 and 9 (2). In 7.4–7.6% of such cases, no serious co-occurring impairments are to be expected (1, 3). ICD-10 (F80.-) names such disorders "specific developmental disorders of speech and language" (e1) but ICD-11 (6A01.0) refers to them simply as "developmental speech or language disorders" and (6A01.2) "developmental language disorders" (DLD) (e2). In a further 2.3% of children, problems with language development are associated with comorbidities, such as hearing loss, autism spectrum disorders (ASD), neurological disorders, or intellectual disability (1, 4, 5). In the German guideline presented here (1) and in a consensus statement by experts in German-speaking countries (4), all of the above-named types of non-acquired childhood language disorders are referred to as „developmental language disorders" (DLD), whereas the international consortium CATALISE only refers to those without comorbidities as DLD (4). DLDs affect one or more linguistic domains expressively, i.e., concerning language production, and/or receptively, i.e., concerning language comprehension: phonological (speech sound production and use), lexical-semantic (vocabulary and word meaning), morpho-syntactic (grammar; structure of sentences and words), and/or communication (pragmatics)(6) *(Box 1)*.

DLD must be distinguished from environmental language difficulties (e.g., German as second language) and some congenital or

Box

Grammatical (morpho-syntactic) impairment

The main components of grammar are syntax and morphology. Syntax determines how words are arranged into phrases and sentences, while morphology refers to the internal structure of words. The grammatical functions of words are indicated by noun and verb inflection, i.e., number and case marking or verb conjugation. Symptoms of syntactic impairment include below-average performance in sentence comprehension, limited sentence complexity and variability, reduced length of utterances, omission of obligatory constituents (e.g., omission of subject: "stroke dog") or function words (e.g., omission of articles: "girl strokes dog"), absence of subordinate clauses, verb placement errors (such as the final verb position in a declarative sentence, "Lisa cake eats") or rigid sentence structures. Morphological deficits are characterized by inflection errors caused by missing or inappropriate affixes. Examples of morphological errors are violations of subject-verb agreement ("Lisa eat cake"), incorrect formation of participles ("the dog has swimmed"), and errors in gender, number, or case marking.

Intervention focuses on sentence formation with correct word order, especially correct verb placement (i.e., verb-second in German declarative sentences), flexible use of different sentence structures, and the establishment of morphological paradigms, in particular subject-verb agreement and noun inflection (gender, number, case). Implicit methods are used to enrich the input with target structures or to provide feedback by offering recasts and expansions of the child's utterances. Explicit methods evoke sentence structures, create production opportunities, or convey syntactic rules through metalinguistic instructions and visualizations (e.g., symbols for sentence constituents). Both methodological approaches should be combined *(Table 1)* (14, 27, 30, e32), and interfaces with other linguistic domains (phonological, lexical) need to be considered (e33, e34).

acquired speech sound disorders (SSD), namely those with impaired cerebral speech motor planning (developmental verbal dyspraxia, childhood apraxia of speech, CAS), speech motor execution control (dysarthria), or impaired articulation (peripheral speech motor disorder or phonetic SSD) *(Figure 1)*.

DLDs often impair children's social-emotional and cognitive development, social participation, educational outcomes and career opportunities (7–9, e4). Furthermore, DLD is frequently associated with learning, behavioral, attention-deficit/hyperactivity disorders, motor and coordination deficits, and low self-esteem (10–12).

Symptoms can persist into adulthood (7–12). Forty to 55% of children with DLD have problems later with literacy acquisition, around 40% have learning difficulties (7, 8, 13, e5–e8) as well as a lower level of cognition ($p < 0.001$), lower educational attainment ($p = 0.01$), and lower occupational status ($p < 0.0001$) than their linguistically well-developed peers (12). A clinical practice guideline on intervention for DLD and late talkers (LT) has been developed in view of the fact that DLDs do not usually resolve without specialist intervention (6, 11) and that language therapy is effective, at least in the short term, according to systematic reviews and meta-analyses (14–16). In Germany they usually start too late, take a long time, and are only occasionally supported by high-quality German studies (17).

Methods

The guideline fulfills all requirements of an S3-guideline (clinical practice guideline) in accordance with the regulations of the Association of the Scientific Medical Societies in Germany (AWMF) (e9) and involved a multidisciplinary committee of 23 scientific societies/associations and a patient organization *(eTable 1)*. The handling of conflicts of interest was transparent. A systematic literature search and evaluation of the evidence, taking into account DLD/LT-specific criteria, was conducted, and there was a structured, formal consensus process involving two digital voting rounds and five AWMF-moderated consensus conferences.

The effectiveness of interventions for DLD and LT was examined in a systematic literature review *(Figure 2)*, for DLD in general and differentiated into its linguistic domains. Furthermore, systematic literature searches were conducted for DLD interventions regarding cases of multilingualism, hearing loss, intellectual disability, ASD, selective mutism, language-related syndromes, and multiple disabilities, as well as for inpatient language rehabilitation and for implementation in educational institutions (17). The guideline recommendations are predominantly based on randomized controlled trials (RCTs) or systematic reviews and meta-analyses. As effect sizes tend to be overestimated in pre-post intervention comparisons, studies with several months of follow-up were included where possible.

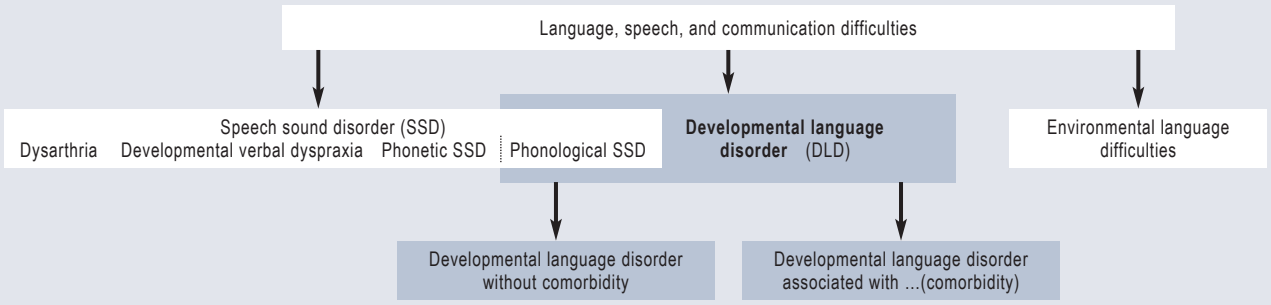
Developmental language delay (late talkers)

Developmental language delay affects children without apparent language-related comorbidities whose vocabulary size is in the lower 10% range according to parent questionnaires (e10) or who do not produce word combinations by their 2nd birthday. Prevalence is approximately 15%. The term LT should only be applied to children between their 2nd and 3rd birthdays. In international and German studies, a vocabulary size of fewer than 50 words or the absence of word combinations at 24 months are associated with an increased risk of DLD (e11–e15; for example, 2.5-fold increase in the presence of delayed word combinations; e13). Precisely determining a child's vocabulary size using parental questionnaires depends on the number and choice of words presented in the questionnaire; with gender-related results in favor of girls (e16–e21).

If a language delay is detected, for example at the standard pediatric child screening in Germany (U7, at 21–24 months), the child's language development shall be monitored within the next 3 months, until the 27th month at the latest, supplemented by further observation and test procedures. A decision is then made as to whether and which interventions are indicated. Early intervention should begin in the third year of life in LTs, because only approximately one third of children catch up by their third birthday, one third develop DLD and another third maintain some language deficits (e22).

In the case of expressive delay (18, 19, e26, e27), parent-based interventions should be provided first, e.g.,

Figure 1



Classification of developmental language disorders and similar language, speech, and communication difficulties (4) in childhood

the structured "Heidelberg Parent-Based Language Intervention" (20, e23–e25). Child-centered early language intervention (18, e26, e28) conducted by speech and language therapists should be offered—potentially combined with parent training (21)—if a) expressive language skills do not clearly improve after parent-based intervention or in the presence of b) additional language comprehension deficits or c) other risk factors (familial disposition for DLD, low parental education level, low nonverbal cognitive abilities of the child). During intervention, language comprehension should be targeted first, followed by language production methods *(Table 1)*. If LTs present with DLD at 3 years of age, further language therapy is required. However, early intervention may reduce the number of subsequent therapy sessions required (e25).

Speech sound disorders

Speech sound disorders (SSDs) are among the most commonly treated developmental abnormalities in children (prevalence: 3.8 to 16%, sex ratio: 3 ♂ : 1 ♀). SSD results in reduced intelligibility of a child's utterances.

Only phonological disorders are classified as DLDs *(Figure 1)*. Phonological processes (error patterns) are rule-like simplifications or changes of adult speech which are typically observed during speech development. They need to be differentiated diagnostically from atypical phonological error patterns which do not occur during typical speech development. A distinction is also made between functional SSDs and those of organic origin. The following classification is commonly used for functional SSDs: 1. phonological disorder with consistent word realization (DLD): inappropriate phonological pattern usage; delayed error patterns and/or atypical patterns; replacement or omission of sounds, sound combinations, or syllables occurs in a consistent manner; 2. inconsistent phonological disorder (DLD): inability to retrieve the correct sounds in the correct sequence for word production; inability to create automated word production plans for the same word in a consistent manner.

These two subgroups are categorized as DLD, while phonetic disorders (articulation disorders) are not. The latter are articulatory or motor SSD (e.g., distorted /s/ sound-production in the form of an interdental lisp). Phonetic disorders (lisps, lateral <sh> production) do not necessarily require treatment because they do not influence language or literacy development. If treatment is provided, traditional motor-oriented articulation therapy should be offered (Van-Riper approach) (22), with treatment starting regardless of secondary dentition.

Phonological disorders can adversely affect the acquisition of literacy skills (23, e29, e30) and should be treated as early as at the age of three years. For children with delayed phonological patterns, treatment should begin no earlier than six months after the age at which more than 90% of typically developed children have overcome these patterns. Phonological or integrated phonological treatment shall be provided for children with phonological disorders and consistent word production (23–25). An approach such as Core Vocabulary Therapy can be useful for inconsistent word production (e31).

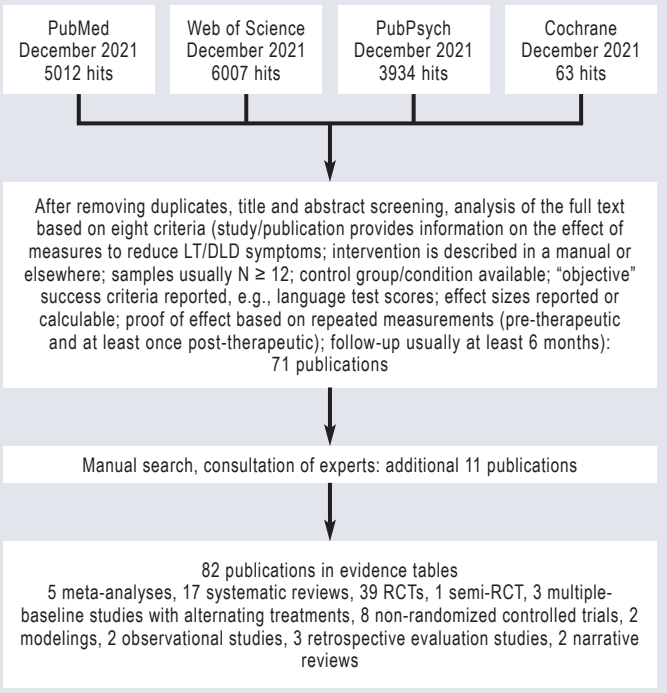
Lexical-semantic impairment

Lexical-semantic impairment is associated with problems in the acquisition, processing, storage (mapping of acoustic [phonological] word form and word meaning [semantics]), retrieval, and/or use of words. Receptive and/or expressive vocabulary and lexical diversity are reduced, and knowledge of word meaning is fragile. Approximately 25% of children with DLD demonstrate word finding or retrieval difficulties.

Vocabulary intervention shall promote word comprehension and production and support children in acquiring words, in broadening their vocabulary, working out the meaning of words, linking words semantically, and facilitating word access. Effective components of vocabulary intervention include:

- Basic skills such as understanding symbols and categorizing words into superordinate and subordinate terms, e.g., "animal" as superordinate category of "dog"; "poodle" and "dachshund" as coordinated terms, which are subordinated to "dog".
- Introducing target words selected according to linguistic criteria
- Elaborating semantic and phonological word characteristics
- Improving the structure of the mental lexicon
- Teaching word-finding strategies (26–29).

Figure 2



Systematic literature review (01/1999–12/2021) and selection of LT/DLD interventions (excluding DLD with comorbidities)
N, number of participants; RCT, randomized controlled trial; LT, late talker; DLD, developmental language disorder

The components and methods of vocabulary intervention shall be selected with regard to the child's individual symptoms. Children shall be given a variety of opportunities to use words, for example during naming games or by associative recall of words that match generic terms, semantic fields, or initial sounds/letters. A variety of methods shall be used *(Table 1)*, combining implicit with explicit methods. Implicit methods (input enhancement with selected target words presented very frequently) do not impose any direct demands on the child; instead, learning contexts are enriched and optimized. Explicit methods (direct reflection on word form and meaning, teaching of strategies for word acquisition, storage, and retrieval) require the child to consciously engage with language. Visualizations and gestures may have a supporting effect on word learning.

Impairment of mainly pragmatic language (social-pragmatic communication disorders)

Children with pragmatic-communicative impairment have deficits in the use of language and nonverbal and paraverbal signs for social purposes, for example in discourse, turn-taking, nonverbal communication, emotion recognition, gestures and facial expressions, linguistic adaptation to different contexts, and/or of coherence and cohesion of narrative content (e35). English-language evidence-based intervention concepts are available for pragmatic-communicative skills in ASD. Intervention focuses on intra- and interpersonal skills in communication behavior/conversation, text processing/production, situational/contextual behavior and the strengthening of basic skills such as sensory, motor, socio-emotional skills, memory, and attention *(eTable 1)*.

Developmental language disorders in bi- and multilingual children

Multilingualism is usually a benefit. It does not cause DLD, nor does it increase the risk of DLD. Multilingual children often demonstrate linguistic peculiarities during language acquisition arising from language interference. These environmental language difficulties must be distinguished by differential diagnosis from DLD, with which they may share a phenomenological resemblance. They do not require treatment; the children need an increase in input and pedagogical support in their surrounding (second) language (6). DLD always affects all the languages spoken by the child, however symptoms are sometimes language-specific (e36). Individualized therapy based on the WHO's International Classification of Functioning, Disability and Health (ICF), taking into account the linguistic and cultural environment and bio-psycho-social factors, is essential (e37). Where possible, language therapy should also include the child's first language(s). Such therapy is particularly effective and demonstrates transfer effects to the non-treated language(s). Nevertheless, language interventions in only one language are also effective (31, 32, e38, e39). Therapy methods that have proven effective for monolingual children should also be used for multilingual children, flanked by pedagogical language support if necessary. Language mixing in multilingual families is the rule. Contrary to previous recommendations of the "one-parent-one-language" principle, parents should speak with their child in their preferred language(s) (e40).

Inpatient language rehabilitation

Inpatient language rehabilitation for DLD is practiced specifically in Germany, and its effectiveness has been proven (33, 34, e41). Rehabilitation is indicated if long-term effects on physical and/or mental activities, performance, and participation are to be expected (e42), for example where the success of a prolonged outpatient DLD treatment is limited. Therapy should also focus on language-promoting strategies by the family and include the accompanying parent in the intervention. This recommendation follows a meta-analysis of 59 RCTs and 17 non-randomized controlled trials (NRCTs) which demonstrated that parent-implemented intervention strategies in children up to the age of six years effectively improve the language-promoting behavior of parents and the language outcomes of their children (35).

Treatment of developmental language disorders associated with comorbidities

Intellectual disabilities, language-relevant syndromes, and multiple disabilities

Children with DLD and intellectual disabilities, learning difficulties, global developmental delay or language-relevant syndromes should receive early language therapy and support in accordance with the intervention

Table 1

Evidence-based intervention techniques and components for late talkers, lexical-semantic and morpho-syntactic impairments (modified after 27)

Method/Technique	Other terms	Explanation
Implicit methods do not impose any direct demands on the child and are particularly suitable for initial use with younger children. Learning contexts are enriched and optimized.		
Input enhancement,	Modeling, focused stimulation, input optimization, auditory bombardment	Highly frequent, dense, and concise presentation of target structures (words, grammatical structures) using enhanced input to direct attention to specific target structures, often combined with contrasting two structures
(Conversational) recasting	-	Responding to a child's utterance with feedback techniques such as corrective feedback and expansion
Explicit methods involve working directly on linguistic target structures. They require the child to consciously engage with language.		
Elicitation techniques	Elicited production, prompting, elicited imitation	Eliciting a specific verbal response; evoking language structures in communication-stimulating interactions; creating opportunities for language production
Metalinguistic methods*	Metalinguistic/explicit instruction	Explanation of, and conscious engagement with, language structures and rules, often combined with visualizations

* not applicable to late talkers

approaches described above. The intervention used should consider the cognitive and general level of the child's development and be integrated into a comprehensive therapy and support concept within a multiprofessional team. A family-centered, individual, multimodal communication approach (e.g., using spoken language, gestures, external communication aids) should be aimed for (35, 36, e43–e48).

People with disabilities require augmentative and alternative communication (AAC) at an early stage if their communication skills and social participation are severely impaired or threatened (e49–e56). AAC distinguishes between unaided forms of communication (facial expressions, gazes, vocalizations, gestures, sign languages and systems …) as well as aided low-tech (non-electronic) forms (communication boards, folders, symbol cards, photos …) and high-tech (electronic) communication aids (buttons, talkers, or tablets with and without voice output …). Interventions (especially "modeling") that teach the use of the AAC system in speech-language therapy and everyday life, and instruct the closest caregivers, improve communication and language skills (e54, e55). Brain-computer interfaces can provide access to communication for people with severe speech or language and physical disabilities (e56).

Autism spectrum disorders

Early evidence-based therapy and promotion of social communication and language development are central to the treatment of ASD and are set out in a separate S3-guideline (37). Children with ASD and intellectual disability usually present impaired or absent (expressive) language development. With language and communication-promoting interventions, many children develop verbal communication skills preceded by nonverbal communication skills (e52).

Selective mutism

This anxiety disorder manifests itself in consistent, permanent selective inability to speak in certain social situations. Children with selective mutism are unable to speak in the presence of certain individuals or in specific situations, although their underlying ability to speak is unimpaired. The core symptoms occur frequently in association with developmental (e.g., DLD), cognitive (e.g., social anxiety), behavioral (e.g., withdrawal), and emotional (e.g., shyness) symptoms. The main components of behavioral therapy include exposure-based methods to tackle defined anxiety situations, parent-based contingency management, and desensitization. Social skills training, language therapy, and pharmacotherapy may also be necessary (38).

Hearing loss

There is ample evidence that early detection of infant hearing loss through newborn hearing screening, early treatment with hearing aids or cochlear implants, and family-centered early intervention have a beneficial effect on the child's language development and reduce the burden on parents (e57–e62). The quality of parental language input is a key factor. The guideline recommends intervention programs to improve the quality and quantity of language stimulation and parent-child interaction for the age range 0.5–5 years, preferably from the first year of life. From the age of around 2 to 2.5 years, family-centered language therapy is recommended for DLD, in addition to specialist early hearing support. For children aged 3 years and older with persistent specific (e.g.,

Table 2

Effectiveness of interventions available in Germany for developmental language delays/disorders and exemplary evidence

Area/disorder	Intervention	Effects, effect sizes*1	Recommendations*2
Developmental language delay (late talker; LT)	Early interventions in the 3rd year of life to stimulate vocabulary & syntax • Parent-centered, e.g., Heidelberg Parent-based Language Intervention • Child-centered (language therapy) • Parent-centered and child-centered in combination	g = 2.33 for expressive and 1.42 for receptive language measures, g = 1.54 for mean length of utterance (*18*, e26[I]), d = 0.61 for number of different target words as reported by parents (e28, *18*) • g = 0.35 for receptive language measures, g = 0.82 for expressive language measure (***19***); d = 0.72–1.16 expressive language measures pre–post (20); follow-up 2 years: d = 0.68–0.75 (e25) • g = 0.73 for expressive and −0.20 for receptive language (both ns) (e26[II], *18*); g = 0.61 for number of different words as reported by parents, g = 0.90 for mean length of utterance (e28, *18*) • Indirect proof of effectiveness (*18*)	**Should** be applied*3 **Shall** initially be applied for expressive developmental language delay **Should** be offered where there is a lack of improvement after parent-centered intervention or in cases of receptive deficits or DLD risk factors **May** be considered in cases of receptive deficits or DLD risk factors
Developmental language disorder (DLD) in general	Language therapy in general Intervention as group versus individual intervention and clinician-administered versus implemented by trained parents Inclusion of peers without DLD in therapy Parent-centered intervention for children up to 6 years of age: training parents to implement language-promoting communication strategies, e.g,, dialogic picture book reading	Effective for children with phonological (SMD = 0.44) and vocabulary difficulties (SMD = 0.89), inconsistent for expressive syntax (SMD = 1.02), less for receptive difficulties (SMD = −0.04) (***14***) or inconsistent (n.d.) (*15*, e85) No difference in effectiveness (SMD = 0.01) (***14***) Effective (SMD = 2.29) (***14***) Children with DLD: major effects for communication, engagement, and language in general (g_m 0.82), language reception (g_m = 0.92) and expression (g_m = 0.83), medium effect for social communication (g_m = 0.37) Parents: strong association between parent training and use of language support strategies (g_m 0.55) (***35***)*4	Children with DLD **shall** receive evidence-based, disorder-specific, development-oriented, parent- or child-centered language intervention. Therapy **shall** establish age-appropriate language competence and performance and prevent negative psycho-emotional, social, cognitive, edu- cational, and occupational consequences. Outpatient, day-care, or inpatient treatment settings, individual or group ther-apy, intensive, interval, or extensive treatment forms **shall** be adapted to in-dividual needs. If the treatment goal is not achieved, multi-dimensional diagnostic assessments **should** be performed and a treatment plan drawn up based on the bio-psycho-social ICF model.
DLD: phonological speech sound disorder (SSD)	Early treatment Phonological or integrated phonological intervention, e.g., PhonoSens (23, 24) Treatment focused on consistent word production	Age 3.6–5.5 yrs: d = 0.89–1.04 for pre-post language measures, without age effect (24) Pre-post IG versus CG: % correct consonants: d = 0.89; reduction in phonological error patterns: d = 1.04 (24); follow-up 3–6 yrs: 11.5% spelling disorders in IG, 56% in comparable group, 22% in a large age-matched cohort (23) n.d., core vocabulary therapy is more effective for inconsistent word production than phonological therapy, which is more effective for consistent word production (p = 0.001); follow-up 8 weeks (e31)*5	Phonological SSDs **should** be treated from age 3 years. A phonological or integrated phonological therapy approach **shall** be applied for phonological SSDs with consistent word production. This approach **may** be considered for phonological SSDs with inconsistent word production.
DLD: lexical-semantic impairment	Vocabulary intervention: Methods in *Table 1*	Large effect on vocabulary improvement (g = 0.88); major effect on word learning at ages ≤ 5 yrs. (g = 0.85) and 5–6 yrs. (g = 0.94) (***28***)	**Shall** be carried out from the age of 3 and may even be indicated beforehand for LTs **Should** exploit variety of methods and **shall** include word understanding and production as well as create a variety of opportunities to use words
DLD: grammatical (morpho-syntactic) impairment	Grammatical intervention: Focus on sub-areas of grammar Methods in *Table 1*	Expressive syntax: d = 0.70, receptive syntax: d = −0.04 (***14***) Feedback techniques: short-term mean effect size from 8 individual d's was 0.96 for proximal and 0.76 for global language measures of grammar development; reflects a positive benefit of approx. 0.75–1.00 SD; long-term mean effect size 0.76, benefit approx. 0.5–1.0 SD (***30***)	**Shall** be conducted with specifically selected target structures Methods from *Table 1* **should** be used, preferably in combination: initially mainly implicit, later explicit methods
DLD in bi-/multilingual children	Approaches that are effective for monolingual children Treatment in all the child's languages	n.d., vocabulary intervention for bilingual children conducted in the surrounding (second) language only promotes vocabulary development of this language; bilingual intervention promotes both native and second-language vocabulary (31)	**Should** also be used for multilingual children First language(s) **should** be included wherever possible.
Inpatient DLD rehabilitation	Multimodal, intensive, interdisciplinary as block or interval therapy	Inpatient block and interval treatments are (equally) effective for language comprehension (d = 0.89 and d = 0.91, respectively) and expressive vocabulary (d = 0.60 and d = 0.79, resp.) (34)*6	**Should** be considered if significant, persistent deficits in language development and verbal communication are present or imminent

IG, intervention group; CG, control group; NRCT, non-randomized controlled trial; RCT, randomized controlled trial; SD, standard deviation; DLD, developmental language disorder; LT, late talker; ns, not significant; SMD, standardized mean difference
Footnotes to *Table 2*:
[*1] Effects: intervention groups compared with control groups; effect sizes: n.d. (no details) where data is missing or cannot be calculated from the data provided (17); (mean) Hedges' g (g_m), Cohen's d, SMD are classified by convention as small (≥ 0.20), moderate (≥ 0.5–0.8), and large (≥ 0.80)
[*2] Recommendations (based on strength of evidence or clinical consensus): shall/shall not – strong recommendation, should/should not – recommendation; may/may not be considered – open recommendation
[*3] The wording of the guideline has been slightly edited for greater clarity and more consistency.
[*4] Meta-analysis (***35***) rated g_m according to weighting above that indicated under [*1]
[*5] Multiple-baseline design with alternating treatments
[*6] Retrospective analysis

References:
italics: systematic review; ***italics and bold: meta-analysis***; underlined: RCT
Reference (*18*): 9 studies, 5 RCTs, 3 NRCTS; including reference (e26[I]): pre-post 6 months, IG focused stimulation delivered by trained parents, CG delayed-treatment; reference (e26[II]): IG direct speech-language therapy, CG general cognitive stimulation delivered by trained parents; reference (e28): pre-post 12 weeks, IG clinician-implemented language therapy, CG delayed-treatment
Reference (***19***): 18 trials, 15 RCTs
Reference (20): pre 3 months after end of intervention, follow-up 12 months (not reported here), IG parent training, delayed-treatment CG; reference (e25): follow-up two years
Reference (***14***): 25 RCTs
Reference (*15*): 25 RCTs
Reference (e85): narrative review
Reference (***35***): 76 studies: 59 RCTs, 17 NRCTs
Reference (24): IG speech-language therapy, CG delayed-treatment; reference (23): follow-up 3–6 years
Reference (e31): multiple-baseline design with alternating treatments
Reference (***28***): 67 trials, including RCTs
Reference (***30***): 35 publications for systematic review, 14 trials for meta-analysis
Reference (31): pre-post, 4 parallel groups (IG 1–4)
Reference (34): retrospective analysis

morphological) difficulties, the guideline recommends an approach in which evidence-based language therapy for normal hearing children is adapted to children with hearing loss. This includes work on morpho-syntactic, phonological, semantic-lexical, and narrative skills, supplemented where necessary by training auditory and memory skills with linguistic material. For children with additional impairments, AAC therapy elements are recommended, as well as active music-making in speech-language rehabilitation (39, e63–e83).

Summary of interventions for DLD and LT

Systematic reviews and meta-analyses confirm the clear short-term effectiveness and some long-term effectiveness of speech and language therapy, particularly for children with phonological or expressive vocabulary difficulties, but less so for receptive language difficulties (14, 15, e85). Inconsistent results were found for expressive syntax interventions (14). Group therapy is as effective as individual therapy, interventions by trained parents as effective as those by specialists, and the inclusion of peers with typical linguistic development in therapy is also effective (14). Early interventions, such as parent training and language therapy, can address the risk of LTs developing DLD. Inpatient language rehabilitation should be considered for evident or impending developmental language and communication deficits. Evidence of effectiveness and guideline recommendations for all of the above-mentioned interventions are shown in *Table 2* and *eTable 2*.

Education

Given that poor language skills in children correlate with lower educational attainment, educational recommendations were also included in the guideline. Besides language therapy, children with DLD need integrated language adaptation in daycare and in school, for example the simplification of linguistic-communicative contexts so that they can understand the teacher, their peers, and the content of the lessons despite their impaired language processing abilities. Furthermore, integrated language therapy and language support should counteract problems in language as well as task and text comprehension in order to improve learning and educational participation in accordance with the bio-psycho-social ICF model (40, e84). Parents and educational professionals should be advised to take children's linguistic and communicative limitations into account when planning teaching and learning contexts and educational programs.

Need for action and research

Research on DLD in Germany often does not meet international standards. Individual case studies or small samples and qualitative analyses predominate. Follow-ups are often absent. Only five German RCTs from three working groups were available for the guideline's systematic review. The guideline confirms the need for therapy research in Germany in order to make therapy procedures, dosages, and settings (e.g., individual versus group therapy, extensive versus intensive therapy or interval therapy) more effective. Although internationally recognized as highly effective, parent training is rarely used and is not regularly reimbursed by health insurance companies; small group therapy for outpatients, online therapy (e127), and the inclusion of linguistically typically developed peers are infrequently employed. Early interventions for LT and DLD are still the exception. Language therapy usually takes place late, at ages five to nine. Treatment practice and remedy guidelines in Germany should therefore be adapted to the current state of knowledge.
Video and audio files are available for this article.

Acknowledgments
We would like to thank all persons and organizations involved in the development of the guideline (*eTable 1*), and especially Natalja Bolotina, Harald A. Euler, Jessika Melzer, Corinna Gietmann, Philipp Mathmann, Theresa Rieger, and Fabian Burk for their assistance in preparing the evidence tables and the guideline report.

Conflict of interest statement
AFB developed the phonological therapy P.O.P.T. [Psycholinguistically Oriented Phonology Therapy] and is the first author of its publications. She receives royalty and license fees.

CK co-developed the PLAN therapy concept and receives author's fees from Elsevier.

CKH co-developed the ELAN-R test and received an author's fee for this.

KN is senior author of publications on the phonological therapy method PhonoSens. She receives lecture fees from SONOVA Retail, the DGSS (German Society of Speech, Language and Voice-Pathology),the DBVPP (German Professional Organization of Phoniatricians and Pediatric Audiologists), the BVKJ (German Professional Association of Pediatricians), and the EUHA (European University Hospital Alliance).
CL is the First Chairperson of the Association for Interdisciplinary Language

Acquisition Research and Childhood Language Disorders in German-speaking Countries.

SS declares that no conflict of interest exists.

Manuscript received on 28 November 2023, revised version accepted on 8 January 2024.

Translated from the original German by the authors, by Ross Parfitt, and by Dr Grahame Larkin

As with many other professional journals, clinical guidelines in the German Medical Journal *Deutsches Ärzteblatt* are not subject to the peer review process, as S3 guidelines are texts that have already been assessed and discussed many times by experts (peers) and have a broad consensus.

Refrences

1. Norbury CF, Gooch D, Wray C, et al.: The impact of nonverbal ability on prevalence and clinical presentation of language disorder: evidence from a population study. J Child Psychol Psychiatry 2016; 57: 1247–57.
2. Waltersbacher A: Heilmittelbericht 2022/2023. Ergotherapie, Sprachtherapie, Physiotherapie, Podologie. Berlin: WIdO – Wissenschaftliches Institut der AOK; 2023; www.wido.de/fileadmin/Dateien/Dokumente/Publikationen_ Produkte/Buchreihen/Heilmittelbericht/wido_ hei_heilmittelbericht_ 2022_2023.pdf (last accessed on 12 December 2023).
3. Tomblin JB, Records NL, Buckwalter P, Zhang X, Smith E, O'Brien M: Prevalence of specific language impairment in kindergarten children. J Speech Lang Hear Res 1997; 40: 1245–60.
4. Lüke C, Kauschke C, Dohmen A, et al.: Definition and terminology of developmental language disorders—interdisciplinary consensus across German-speaking countries. PLoS One 2023; 18: e0293736.
5. Neumann K, Arnold B, Baumann A, et al.: Neue Terminologie von Sprachentwicklungsstörungen? Monatsschr Kinderh 2021; 169: 837–42.
6. De Langen-Müller U, Kauschke C, Kiese-Himmel C, Neumann K, Noterdaeme M: Diagnostik von (umschriebenen) Sprachentwicklungsstörungen. Eine interdisziplinäre Leitlinie. In: Kiese-Himmel C (eds.): Sprachentwicklung – Verlauf, Störung, Diagnostik, Intervention. Frankfurt/M: Peter Lang 2012; 19: 27.
7. Aram DM, Ekelman BL, Nation JE: Preschoolers with language disorders: 10 years later. J Speech Hear Res 1984; 27: 232–44.
8. Aram DM, Nation JE: Preschool language disorders and subsequent language and academic difficulties. J Commun Disord 1980; 13: 159–70.
9. Botting N: Language, literacy and cognitive skills of young adults with developmental language disorder (DLD). Int J Lang Commun Disord 2020; 55: 255–65.
10. Nitin R, Shaw DM, Rocha DB, et al.: Association of developmental language disorder with comorbid developmental conditions using algorithmic phenotyping. JAMA Netw Open 2022; 5: e2248060.
11. Felsenfeld S, Broen PA, McGue M: A 28-year-follow-up of adults with a history of moderate phonological disorder: linguistic and personality results. J Speech Hear Res 1992; 35: 1114–25.
12. Felsenfeld S, Broen PA, McGue M: A 28-year follow-up of adults with a history of moderate phonological disorder: educational and occupational results. J Speech Hear Res 1994; 37: 1341–53.
13. McArthur GM, Hogben JH, Edwards VT, Heath SM, Mengler ED: On the „specifics" of specific reading disability and specific language impairment. J Child Psychol Psychiatry 2000; 41: 869–74.
14. Law J, Garrett Z, Nye C: Speech and language therapy interventions for children with primary speech and language delay or disorder. Cochrane Db Syst Rev 2003; 3: CD004110.
15. Nelson HD, Nygren P, Walker M, Panoscha R: Screening for speech and language delay in preschool children: systematic evidence review for the US Preventive Services Task Force. Pediatrics 2006; 117: e298–319.
16. Hartmann E: Wirksamkeit von Kindersprachtherapie im Lichte systematischer Übersichten. Vierteljahresschr Heilpadagog Nachbargeb 2012; 81: 191–209.
17. Neumann K, Kauschke C, Lüke C, et al.: Therapie von Sprachentwicklungsstörungen. Interdisziplinäre S3-Leitlinie, Version 1.1, AWMF-Registernr. 049–015, Deutsche Gesellschaft für Phoniatrie und Pädaudiologie (DGPP) (ed.): 2022; www.register.awmf.org/de/leitlinien/detail/049–015 (last accessed on 12 December 2023).
18. Cable AL, Domsch C: Systematic review of the literature on the treatment of children with late language emergence. Int J Lang Commun Disord 2011; 46: 138–54.
19. Roberts MY, Kaiser AP: The effectiveness of parent-implemented language interventions: a meta-analysis. Am J Speech Lang Pathol 2011; 20: 180–99.
20. Buschmann A, Jooss B, Rupp A, et al.: Parent based language intervention for 2-year-old children with specific expressive language delay: a randomised controlled trial. Arch Dis Child 2009; 94: 110–6.
21. DeVeney SL, Hagaman JL, Bjornsen AL: Parent-implemented versus clinician- directed interventions for late-talking toddlers: a systematic review of the literature. Comm Disord Q 2017; 39: 293–302.
22. Preston J, Leece M: Articulation interventions. In: Williams A, McLeod S, McCauley R (eds.): Interventions for children with speech sound disorders. Baltimore, MD: Brooks 2021; 526–58.
23. Siemons-Lühring DI, Hesping AE, Euler HA, et al.: Spelling proficiency of children with a resolved phonological speech sound disorder treated with an integrated approach-a long-term follow-up randomized controlled trial. Children (Basel) 2023; 10: 1154.
24. Siemons-Lühring DI, Euler HA, Mathmann P, Suchan B, Neumann K: The effectiveness of an integrated treatment for functional speech sound disorders: a randomized controlled trial. Children (Basel) 2021; 8: 1190.
25. Fox-Boyer AV: POPT – Psycholinguistisch orientierte Phonologie-Therapie: Therapiehandbuch. Idstein: Schulz-Kirchner 2014.
26. Lowe H, Henry L, Müller LM, Joffe V: Vocabulary intervention for adolescents with language disorder: a systematic review. Int J Lang Commun Disord 2018; 53: 199–217.
27. Kauschke C, Rath J: Implizite und/oder explizite Methoden in Sprachförderung und Sprachtherapie – was ist effektiv? Forsch Spr 2017; 5: 28–43.
28. Marulis L, Neuman S: The effects of vocabulary intervention on young children´s word learning: a meta-analysis. Rev Educ Res 2010; 80: 300–35.
29. Motsch HJ, Marks D: Efficacy of the lexicon pirate strategy therapy for improving lexical learning in school-age children: a randomized controlled trial. Child Lang Teach Ther 2015; 31: 237–55.
30. Cleave PL, Becker SD, Curran MK, Van Horne AJ, Fey ME: The efficacy of recasts in language intervention: a systematic review and meta-analysis. Am J Speech Lang Pathol 2015; 24: 237–55.
31. Restrepo MA, Morgan GP, Thompson MS: The efficacy of a vocabulary intervention for dual-language learners with language impairment. J Speech Lang Hear Res 2013; 56: 748–65.
32. Thordardottir E, Cloutier G, Ménard S, Pelland-Blais E, Rvachew S: Monolingual or bilingual intervention for primary language impairment? A randomized control trial. J Speech Lang Hear Res 2015: 58: 287–300.
33. Fermor C: Effektivität stationärer Sprachtherapie bei Kindern mit Sprachentwicklungsstörungen. Sprachtherapie aktuell: Forschung-Wissen-Transfer: Schwerpunktthema: Intensive Sprachtherapie 2017; 1: e2017–02.
34. Keilmann A, Kiese-Himmel C: Stationäre Sprachtherapie bei Kindern mit schweren spezifischen Sprachentwicklungsstörungen. Laryngo-Rhino-Otol 2011; 90: 677–82.
35. Roberts MY, Curtis PR, Sone BJ, Hampton LH: Association of parent training with child language development: a systematic review and meta-analysis. JAMA Pediatr 2019; 173: 671–80.
36. Deutsche Gesellschaft für Kinder- und Jugendpsychiatrie, Psychosomatik und Psychotherapie e.V. (DGKJP): S2k Praxisleitlinie „Intelligenzminderung". www.awmf.org/uploads/tx_szleitlinien/028–042l_S2k_Intelligenzminderung_2021–09.pdf (last accessed on 12 December 2023).
37. DGKJP, DGPPN et al.: Autismus-Spektrum-Störungen im Kindes-, Jugend- und Erwachsenenalter. Teil 2: Therapie. www.awmf.org/uploads/tx_szleitlinien/028–047l_S3_Autismus-Spektrum-Stoerungen-Kindes-Jugend--Erwachsenenalter-Therapie_2021–04_1.pdf (last accessed on 12 December 2023).
38. Steains SY, Malouff JM, Schutte NS: Efficacy of psychological interventions for selective mutism in children: a meta-analysis of randomized controlled trials. Child Care Health Dev 2021; 47: 771–81.
39. Holzinger D, Dall M, Sanduvete-Chaves S, Saldaña D, Chacón-Moscoso S, Fellinger J: The impact of family environment on language development of children with cochlear implants: a systematic review and meta-analysis. Ear Hear 2020; 41: 1077–91.
40. Sallat S: Sprache und Kommunikation in Unterricht und Schule – kein exklusives Problem. In: Budnik I, Grummt M, Sallat S (eds.): Sonderpädagogik – Rehabilitationspädagogik – Inklusionspädagogik. Hallesche Impulse für Disziplin und Profession. 5. Beiheft Sonderpädagog Förd heute. Weinheim: Beltz-Juventa; 2022; 193–213.

Corresponding author
Prof. Dr. med. Katrin Neumann
Department for Phoniatrics and Pediatric Audiology, University Hospital of Muenster, University of Muenster
Malmedyweg 13
48149 Münster Katrin
Katrin.Neumann@uni-muenster.de

Cite this as:
Neumann K, Kauschke C, Fox-Boyer A, Lüke C, Sallat S, Kiese-Himmel C: Clinical practice guideline: Interventions for developmental language delay and disorders. Dtsch Arztebl Int 2024; 121: 155–62.
DOI: 10.3238/arztebl.m2024.0004

Supplementary material
eReferences, eTables, eVideos:
www.aerzteblatt-international.de/m2023.0004

Supplementary material to:

Interventions for Developmental Language Delay and Disorders

by Katrin Neumann, Christina Kauschke, Annette Fox-Boyer, Carina Lüke, Stephan Sallat, and Christiane Kiese-Himmel

Dtsch Arztebl Int 2024; 121: 155–62. DOI: 10.3238/arztebl.m2024.0004

eReferences

e1. Bundesinstitut für Arzneimittel und Medizinprodukte (BfArM): Internationale statistische Klassifikation der Krankheiten und verwandter Gesundheitsprobleme, 10. Revision, German Modification (ICD-10-GM), Version 2023. Berlin: BfArM; 2022; www.bfarm.de/DE/Kodiersysteme/Klassifikationen/ICD/ICD-10-GM/_node.html (last accessed on 12 December 2023).

e2. World Health Organization: International Classification of Diseases 11th revision (ICD-11), Version 01/2023). Geneva: WHO; 2020; www.icd.who.int/en/ (last accessed on 12 December 2023).

e3. Kauschke C, Lüke C, Dohmen A, et al.: Delphi-Studie zur Definition und Terminologie von Sprachentwicklungsstörungen – eine interdisziplinäre Neubestimmung für den deutschsprachigen Raum. Logos 2023; 31: 84–102. www.prolog-shop.de/media/pdf/fb/89/a2/ORG-Delphi_online1.pdf?sPartner=Maerz23–7 (last accessed on 12 December 2023).

e4. Kiese-Himmel C, Kruse E: A follow-up report of German kindergarten children and pre-schoolers with expressive developmental language disorders. Logopedics, Phoniatrics, Vocology 1998; 23: 69–77.

e5. Catts HW, Fey ME, Tomblin JB, Zhang X: A longitudinal investigation of reading outcomes in children with language impairments. J Speech Lang Hear Res 2002; 45: 1142–57.

e6. Pennington BF, Bishop DVM: Relations among speech, language, and reading disorders. Annu Rev Psychol 2009; 60: 283–306.

e7. Snowling MJ, Hayiou-Thomas ME, Nash HM, Hulme C: Dyslexia and developmental language disorder: comorbid disorders with distinct effects on reading comprehension. J Child Psychol Psychiatry 2020; 61: 672–80.

e8. Snowling MJ, Nash HM, Gooch DC, Hayiou-Thomas ME, Hulme C; Wellcome language and reading project team: developmental outcomes for children at high risk of dyslexia and children with developmental language disorder. Child Dev 2019; 90: e548–e64.

e9. Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften (AWMF): AWMF-Regelwerk Leitlinien. www.awmf.org/regelwerk/ (last accessed on 6 November 2023).

e10. Fenson L, Marchman VA, Thal D, Dale P, Reznick JS, Bates E: MacArthur-Bates Communicative Development Inventories: user's guide and technical manual. Baltimore, MD: Brookes 2007.

e11. Desmarais C, Sylvestre A, Meyer F, Bairati I, Rouleau N: Systematic review of the literature on characteristics of late-talking toddlers. Int J Lang Commun Disord 2008; 43: 361–89.

e12. Rescorla L: The Language Development Survey: a screening tool for delayed language in tod-dlers. J Speech Hear Disord 1989; 54: 587–99.

e13. Rudolph JM, Leonard LB: Early language milestones and specific language impairment. Jof Early Interv 2016; 38: 41–58.

e14. Sachse S, Buschmann A: Frühe sprachliche Auffälligkeiten und Frühdiagnostik. In: Sachse S, Bockmann AK, Buschmann A (eds.): Sprachentwicklung. Berlin, Heidelberg: Springer 2020; 205–19.

e15. Szagun G: Langsam gleich gestört? Variabilität und Normalität im frühen Spracherwerb. Forum Logopädie 2007; 21: 20–5.

e16. von Suchodoletz W, Sachse S: Sprachbeurteilung durch Eltern, Kurztest für die U7 (SBE-2-KT), Version vom 17.07.2009. www.ph-heidelberg.de/fileadmin/wp/wp-sachse/SBE-2-KT/SBE-2-KT.pdf (last accessed on 12 December 2023).

e17. Bockmann AK, Kiese-Himmel C: Eltern Antworten – Revision (ELAN-R). Elternfragebogen zur Wortschatzentwicklung im frühen Kindesalter. Göttingen: Beltz; 2012.

e18. Grimm H, Doil H: Elternfragebögen für die Früherkennung von Risikokindern. Göttingen: Hogrefe; 2000.

e19. Szagun G, Stumper B, Schramm SA: FRAKIS: Fragebogen zur frühkindlichen Sprachentwicklung. FRAKIS (Standardform). FRAKIS-K (Kurzform). Frankfurt/Main: Pearson; 2009.

e20. Deimann P, Kastner-Koller U, Esser G, Hänsch S: TBS-TK-Rezension: FRAKIS Fragebogen zur frühkindlichen Sprachentwicklung. FRAKIS (Standardform) und FRAKIS-K (Kurzform). Psychol Rundsch 2010; 61: 169–71.

e21. von Suchodoletz W: Elternfragebögen zur Früherkennung von Sprachentwicklungsstörungen. In: Sachse S (ed.): Handbuch Spracherwerb und Sprachentwicklungsstörungen: Kleinkindphase. München: Elsevier 2015; 131–45.

e22. Kühn P, v. Suchodoletz W: Ist ein verzögerter Sprachbeginn ein Risiko für Sprachstörungen in Einschulungsalter? Kinderärztliche Praxis 2009; 80: 343–48.

e23. Buschmann A: Frühe Sprachförderung bei Late Talkers. Effektivität des Heidelberger Elterntrainings bei rezeptiv-expressiver Sprachentwicklungsverzögerung. Pädiat Prax 2012; 78: 377–89.

e24. Buschmann A, Gertje C: Sprachentwicklung von Late Talkers bis ins Schulalter: Langzeiteffekte einer frühen systematischen Elternanleitung. Logos 2021; 29: 4–16.

e25. Buschmann A, Multhauf B, Hasselhorn M, Pietz J: Long-term effects of a parent-based language intervention on language outcomes and working memory for late-talking toddlers. J Early Interven 2015; 37: 175–89.

e26. Gibbard D: Parental-based intervention with pre-school language-delayed children. Eur J Disord Commun 1994; 29: 131–50.

e27. Girolametto L, Pearce PS, Weitzmann E: Interactive focused stimulation for toddlers with expressive vocabulary delays. J Speech Hear Res 1996; 39: 1274–83.

e28. Robertson SB, Ellis Weismer S: Effects of treatment on linguistic and social skills in toddlers with delayed language development. J Speech Lang Hear Res 1999; 42: 1234–48.

e29. Broomfield J, Dodd B: Clinical effectiveness. In: Dodd B (ed.): Differential diagnosis and treatment of children with speech disorder. London: Whurr 2013; 211–29.

e30. Hayiou-Thomas ME, Carroll JM, Leavett R, Hulme C, Snowling MJ: When does speech sound disorder matter for literacy? The role of disordered speech errors, co-occurring language impairment and family risk of dyslexia. J Child Psychol Psychiatry 2017; 58: 197–205.

e31. Crosbie S, Holm A, Dodd BC: Intervention for children with severe speech disorder: a comparison of two approaches. Int J Lang Commun Disord 2005; 40: 467–91.

e32. Cirrin FM, Gillam RB: Language intervention practices for school-age children with spoken language disorders: a systematic review. Lang Speech Hear Serv Sch 2008; 39: S110–37.

e33. Tyler AA, Lewis KE, Haskill A, Tolbert LC: Efficacy and cross-domain effects of a morphosyntax and a phonology intervention. Lang Speech Hear Serv Sch 2002; 33: 52–66.

e34. Tyler AA, Lewis KE, Haskill A, Tolbert LC: Outcomes of different speech and language goal attack strategies. J Speech Lang Hear Res 2003; 46: 1077–94.

e35. Achhammer B: Förderung pragmatisch-kommunikativer Fähigkeiten bei Kindern: Konzeption und Evaluation einer gruppentherapeutischen Intervention [Dissertation]. München: LMU; 2014a.

e36. Chilla S, Rothweiler M, Babur E: Kindliche Mehrsprachigkeit. Grundlagen – Störungen – Diagnostik. München: Reinhardt; 2022.

e37. World Health Organization. Classification of functioning, disability, and health for children and youth (ICF-CY). Geneva: WHO; 2014; www.apps.who.int/iris/bitstream/10665/43737/1/9789241547321_eng.pdf (last accessed on 12 December 2023).

e38. Petersen DB, Thompsen B, Guiberson MM, Spencer TD: Cross-linguistic interactions from second language to first language as the result of individualized narrative language intervention with children with and without language impairment. App Psycholinguist 2016; 37: 703–24.

e39. Scharff Rethfeld W: Evidenzen zu Empfehlungen und Ansätzen in der Sprachtherapie mit mehrsprachigen Kindern. Forum Logopädie 2017; 31: 18–23.

e40. Lüke C, Ritterfeld U, Biewener A: Impact of family input pattern on bilingual students' language dominance and language favouritism. German as a foreign language 2020; 1: 1–4.

e41. Dippold S, Wolf-Mühlbauer J, Lässig A, Kainz M-A, Echternach M, Keilmann A: Langzeitverlauf nach stationärer Sprachtherapie: schulische und sprachliche Entwicklung von Kindern mit schwerer spezifischer Sprachentwicklungsstörung (SES) HNO 2021; 69: 978–86.

e42. Bundesarbeitsgemeinschaft für Rehabilitation e.V. (BAR): Rehabilitation und Teilhabe: Ein Wegweiser. 2022; www.bar-frankfurt.de/fileadmin/dateiliste/_publikationen/reha_grundlagen/pdfs/WegweiserHandbuch2020.RZweb.pdf (last accessed on 12 December 2023).

e43. Seager E, Sampson S, Sin J, Pagnamenta E, Stojanovik V: A systematic review of speech, lan-guage and communication interventions for children with Down syndrome from 0 to 6 years. Int J Lang Commun Disord 2022; 57: 441–63.

e44. Smith E, Hokstad S, Næss KB: Children with Down syndrome can benefit from language in-terventions; results from a systematic review and meta-analysis. J Commun Disord 2020; 85: 105992.

e45. Tamas D, Marcović, Milankov V: Systemic multimodal approach to speech therapy treatment in autistic children. Med Pregl 2013; 66: 233–9.

e46. Tellegen CL, Sanders MR: Stepping stones triple P—positive parenting program for children with disability: a systematic review and meta-analysis. Res Dev Disabil 2013; 34: 1556–71.

e47. Yoder PJ, Woynaroski T, Fey M, Warren S: Effects of dose frequency of early communication intervention in young children with and without Down syndrome. Am J Intellect Dev Disabil 2014; 119: 17–32.

e48. Yoder PJ, Woynaroski T, Fey ME, Warren SF, Gardner E: Why dose frequency affects spoken vocabulary in preschoolers with Down syndrome. Am J Intellect Dev Disabil 2015; 120: 302–14.

e49. Langarika-Rocafort A, Mondragon NI, Etxebarrieta GR: A systematic review of research on augmentative and alternative communication interventions for children aged 6–10 in the last decade. Lang Speech Hear Serv Sch 2021; 52: 899–916.

e50. Schlosser R, Lee D: Promoting generalization and maintenance in augmentative and alternative communication: a meta-analysis of 20 years of effectiveness research. Augment Altern Comm 2000; 16: 208–26.

e51. Walker VL, Snell ME: Effects of augmentative and alternative communication on challenging behavior: a meta-analysis. Augment Altern Comm 2013; 29: 117–31.

e52. Freitag CM, Jensen K, Teufel K, et al.: Empirisch untersuchte entwicklungsorientierte und verhaltenstherapeutisch basierte Therapieprogramme zur Verbesserung der Kernsymptome und der Sprachentwicklung bei Klein- und Vorschulkindern mit Autismus-Spektrum-Störungen. Z Kinder Jugendpsychiatr Psychother 2020; 48: 224–43.

e53. Leonet O, Orcasitas-Vicandi M, Langarika-Rocafort A, Mondragon NI, Etxebarrieta GR: A systematic review of augmentative and alternative communication interventions for children aged from 0 to 6 years. Lang Speech Hear Serv Sch 2022; 53: 894–920.

e54. Biggs EE, Carter EW, Gilson CB: Systematic review of interventions involving aided AAC modeling for children with complex communication needs. Am J Intellect Dev Disabil 2018; 123: 443–73.

e55. Romski M, Sevcik RA, Adamson LB, et al.: Randomized comparison of augmented and nonaugmented language interventions for toddlers with developmental delays and their parents. J Speech Lang Hear Res 2010; 53: 350–64.

e56. Peters B, Eddy B, Galvin-McLaughlin D, Betz G, Oken B, Fried-Oken M: A systematic review of research on augmentative and alternative communication brain-computer interface systems for individuals with disabilities. Front Hum Neurosci 2022; 16: 952380.

e57. World Health Organization. World report on hearing. Geneva: WHO; 2021. www.who.int/publications/i/item/world-report-on-hearing (last accessed on 12 December 2023).

e58. Moeller MP: Early intervention and language development in children who are deaf and hard of hearing. Pediatrics 2000; 106: e43.

e59. Moeller MP, Carr G, Seaver L, Stredler-Brown A, Holzinger D: Best practices in family-centered early intervention for children who are deaf or hard of hearing: an international consensus statement. J Deaf Stud Deaf Edu 2013; 18: 429–45.

e60. Neumann K, Euler HA, Chadha S, White KR, the International Newborn and Infant Hearing Screening (NIHS) group: A survey on the global status of newborn and infant hearing screening. J Early Hear Detec Intervent 2020; 5: 63–84.

e61. Neumann K, Mathmann P, Chadha S, Euler HA, White KR: Newborn hearing screening benefits children, but global disparities persist. J Clin Med 2022; 11: 271.

e62. Yoshinaga-Itano C, Manchaiah V, Hunnicutt C: Outcomes of universal newborn screening programs: systematic review. J Clin Med 2021; 10: 2784.

e63. Ab-Shukor NFA, Lee J, Seo YJ, Han W: Efficacy of music training in hearing aid and cochlear im-plant users: a systematic review and meta-analysis. Clin Exp Otorhinolaryngol 2021; 14: 15–28.

e64. Ambrose SE, Walker EA, Unflat-Berry LM, Oleson JJ, Moeller MP: Quantity and quality of caregivers' linguistic input to 18-month and 3-year-old children who are hard of hearing. Ear Hear 2015; 36 (Suppl 1): 48–59.

e65. Binos P, Nirgianaki E, Psillas G: How effective is auditory-verbal therapy (AVT) for building language development of children with cochlear implants? A systematic review. Life (Basel) 2021; 11: 239.

e66. Casoojee A, Kanji A, Khoza-Shangase K: Therapeutic approaches to early intervention in au-diology: a systematic review. Int J Pediatr Otorhinolaryngol 2021; 150: 110918.

e67. DesJardin JL, Doll ER, Stika CJ, et al.: Parental support for language development during joint book reading for young children with hearing loss. Commun Disord Q 2014; 35: 167–81.

e68. Dettman S, Wall E, Constantinescu G, Dowell R: Communication outcomes for groups of children using cochlear implants enrolled in auditory-verbal, aural-oral, and bilingual-bicultural early intervention programs. Otol Neurotol 2013; 34: 451–9.

e69. Fung PC, Chow BW, McBride-Chang C: The impact of a dialogic reading program on deaf and hard-of-hearing kindergarten and early primary school-aged students in Hong Kong. J Deaf Stud Deaf Educ 2005; 10: 82–95.

e70. Glanemann R, Reichmuth K, Matulat P, Zehnhoff-Dinnesen AA: Muenster parental programm empowers parents in communicating with their infant with hearing loss. Int J Pediatr Otorhinolaryngol 2013; 77: 2023–9.

e71. Kaipa R, Danser ML: Efficacy of auditory-verbal therapy in children with hearing impairment: a systematic review from 1993 to 2015. Int J Pediatr Otorhinolaryngol 2016; 86: 124–34.

e72. Meinzen-Derr J, Sheldon R, Altaye M, Lane L, Mays L, Wiley S: A technology-assisted language intervention for children who are deaf or hard of hearing: a randomized clinical trial. Pediatrics 2021; 147: e2020025734.

e73. Mishra SK, Boddupally SP: Auditory cognitive training for pediatric cochlear implant recipients. Ear Hear 2018; 39: 48–59.

e74. Nicastri M, Giallini I, Ruoppolo G, et al.: Parent training and communication empowerment of children with cochlear implant. J Early Intervention 2020; 43: 117–34.

e75. Rayes H, Al-Malky G, Vickers D: Systematic review of auditory training in pediatric cochlear implant recipients. J Speech Lang Hear Res 2019; 62: 1574–93.

e76. Roberts MY: Parent-implemented communication treatment for infants and toddlers with hearing loss: a randomized pilot trial. J Speech Lang Hear Res 2019; 62: 143–52.

e77. Roman S, Rochette F, Triglia JM, Schön D, Bigand E: Auditory training improves auditory per formance in cochlear implanted children. Hear Res 2016; 337: 89–95.

e78. van Wieringen A, Wouters J: What can we expect of normally developing children implanted at a young age with respect to their auditory, linguistic and cognitive skills? Hear Res 2015; 322: 171–9.

e79. Wiggin M, Sedey AL, Yoshinaga-Itano C, Mason CA, Gaffney M, Chung W: Frequency of early intervention sessions and vocabulary skills in children with hearing loss. J Clin Med 2021; 10: 5025.

e80. Yanbay E, Hickson L, Scarinci N, Constantinescu G, Dettman SJ: Language outcomes for children with cochlear implants enrolled in different communication programs. Cochlear Implants Int 2014; 15: 121–35.

e81. Yoshinaga-Itano C, Baca RL, Sedey AL: Describing the trajectory of language development in the presence of severe-to-profound hearing loss: a closer look at children with cochlear implants versus hearing aids. Otol Neurotol 2010; 31: 1268–74.

e82. Zamani P, Soleymani Z, Jalaie S, Zarandy MM: The effects of narrative-based language inter-vention (NBLI) on spoken narrative structures in Persian-speaking cochlear implanted children: a prospective randomized control trial. Int J Pediatr Otorhinolaryngol 2018; 112: 141–50.

e83. Zussino J, Zupan B, Preston R: Speech, language, and literacy outcomes for children with mild to moderate hearing loss: a systematic review. J Commun Disord 2022; 99: 106248.

e84. Sallat S, Spreer M: Wenn alltagsintegrierte Sprachbildung nicht reicht: Kinder mit sprachlichem Förderbedarf in der Kita. Berlin: Kita Fachtexte; 2018; www.kita-fachtexte.de/fileadmin/Redaktion/Publikationen/KiTaFT_SallatSpreer_2018_wennalltagsintegrierte-Sprachbildung__01.pdf (last accessed on 12 December 2023).

e85. von Suchodoletz W: Wie wirksam ist Sprachtherapie? Kindheit Entwickl 2009; 18: 213–21.

e86. Kauschke C, Siegmüller J: Der patholinguistische Ansatz in der Therapie von Sprachentwicklungsstörungen im Überblick. Logos 2017; 24: 464–75.

e87. Allen MM: Intervention efficacy and intensity for children with speech sound disorder. J Speech Lang Hear Res 2013; 56: 865–77.

e88. Almost D, Rosenbaum P: Effectiveness of speech intervention for phonological disorders: a randomized controlled trial. Dev Med Child Neurol 1998; 40: 319–25.

e89. Jesus LMT, Martinez J, Santos J, Hall A, Joffe V: Comparing traditional and tablet-based intervention for children with speech sound disorders: a randomized controlled trial. J Speech Lang Hear Res 2019; 62: 4045–61.

e90. McLeod S, Baker E, McCormack J, et al.: Cluster-randomized controlled trial evaluating the effectiveness of computer-assisted intervention delivered by educators for children with speech sound disorders. J Speech Lang Hear Res 2017; 60: 1891–910.

e91. Lee AS, Gibbon FE: Non-speech oral motor treatment for children with developmental speech sound disorders. Cochrane Database Syst Rev 2015; 2015: CD009383.

e92. Motsch HJ, Ulrich T: „Wortschatzsammler“ und „Wortschatzfinder“. Effektivität neuer Therapieformate bei lexikalischen Störungen im Vorschulalter. Sprachheilarbeit 2012; 57: 70–8.

e93. Ebbels SH, Nicoll H, Clark B, et al.: Effectiveness of semantic therapy for word-finding difficulties in pupils with persistent language impairments: a randomized control trial. Int J Lang Commun Disord 2012; 47: 35–51.

e94. Gerber S, Brice A, Capone N, Fujiki M, Timler G: Language use in social interactions of school-age children with language impairments: an evidence-based systematic review of treatment. Lang Speech Hear Res 2012; 43: 235–49.

e95. Branson D, Demchak M: The use of augmentative and alternative communication methods with infants and toddlers with disabilities: a research review. Augment Altern Comm 2009; 25: 274–86.

e96. Dyer K, Santarcangelo S, Luce SC: Developmental influences in teaching language forms to individual with developmental disabilities. J Speech Hear Disord 1987; 52: 335–47.

e97. Fidler DJ, Philofsky A, Hephurn SL: Language phenotypes and intervention planning: bridging research and practice. Ment Retard Dev Disabil Res Rev 2007; 13: 47–57.

e98. Neil N, Jones EA: Communication intervention for individuals with Down syndrome: systematic review and meta-analysis. Dev Neurorehabil 2018; 21: 1–12.

e99. Burgoyne K, Duff FJ, Clarke PJ, Buckley S, Snowling MJ, Hulme C: Efficacy of a reading and language intervention for children with Down syndrome: a randomized controlled trial. J Child Psychol Psychiatry 2012; 53: 1044–53.

e100. Moraleda Sepúlveda EM, López-Resa P, Pulido-García N, Delgado-Matute S, Simón-Medina N: Language intervention in Down syndrome: a systematic literature review. Int J Environ Res Public Health 2022; 19: 6043.

e101. Bäckman B, Grevér-Sjölander AC, Bengtsson K, Persson J, Johansson I: Children with Down syndrome: oral development and morphology after use of palatal plates between 6 and 48 months of age. Int J Paediatr Dent 2007; 17: 19–28.

e102. Adnams CM, Sorour P, Kalberg WO, et al.: Language and literacy outcomes from a pilot intervention study for children with fetal alcohol spectrum disorders in South Africa. Alcohol 2007; 41: 403–14.

e103. Sigafoos J, O'Reilly MF, Ledbetter-Cho K, Lim N, Lancioni GE, Marschik PB: Addressing sequelae of developmental regression associated with developmental disabilities: a systematic review of behavioral and educational intervention studies. Neurosci Biobehav Rev 2019; 96: 56–71.

e104. Bekteshi S, Konings M, Karlsson P, Criekinge TV, Dan B, Monbaliu E: Teleintervention for users of augmentative and alternative communication devices: a systematic review. Dev Med Child Neurol 2023; 65: 171–84.

e105. Bal VH, Katz T, Bishop SL, Krasileva K: Understanding definitions of minimally verbal across instruments: evidence for subgroups within minimally verbal children and adolescents with autism spectrum disorder. J Child Psychol Psyc 2016; 57: 1424–33.

e106. World Health Organization: World report on hearing. Geneva: WHO; 2021. www.who.int/publications/i/item/world-report-on-hearing (last accessed on 12 December 2023).

e107. Tomblin J, Harrison M, Ambrose S, Walker EA, Oleson J, Moeller MP: Language outcomes in young children with mild to severe hearing loss. Ear Hear 2015; 36 (Suppl 1): 76S–91S.

e108. Tomblin JB, Oleson J, Ambrose SE, Walker EA, Moeller MP: Early literacy predictors and second-grade outcomes in children who are hard of hearing. Child Dev 2020; 91: e179–e97.

e109. Ab Shukor NF, Han W, Lee J, Seo YJ: Crucial music components needed for speech perception enhancement of pediatric cochlear implant users: a systematic review and meta-analysis. Audiol Neurootol 2021; 26: 389–413.

e110. Strand EA, Stoeckel R, Baas B: Treatment of severe childhood apraxia of speech: a treatment efficacy study. J Med Speech-Lang Pa 2006; 14: 297–307.

e111. Murray E, McCabe P, Ballard KJ: A randomized controlled trial for children with childhood apraxia of speech comparing rapid syllable transition treatment and the Nuffield Dyspraxia Programme-Third Edition. J Speech Lang Hear Res 2015; 58: 669–86.

e112. Ballard K, Robin D, McCabe P, McDonald J: A treatment for dysprosody in childhood apraxia of speech. J Speech Lang Hear Res 2010; 53: 1227–45.

e113. Morgan AT, Murray E, Liégeois FJ: Interventions for childhood apraxia of speech. Cochrane Database Syst Rev 2018; 5: CD006278.

e114. Murray E, McCabe P, Ballard KJ: A systematic review of treatment outcomes for children with childhood apraxia of speech. Am J Speech Lang Pathol 2015; 23: 486–504.

e115. Thomas DC, McCabe P, Ballard KJ: Rapid Syllable Transitions (ReST) treatment for childhood apraxia of speech: the effect of lower dose-frequency. J Commun Disord 2014; 51: 29–42.

e116. Williams AL, Stephens H: The Nuffield Centre Dyspraxia Programme. In: Williams AL, McLeod S, McCauley R (eds.): Interventions for speech sounds disorders in children. Baltimore, MD: Brookes 2010; 159–77.

e117. McKechnie J, Ahmed B, Gutierrez-Osuna R, Murray E, McCabe P, Ballard KJ: The influence of type of feedback during tablet-based delivery of intensive treatment for childhood apraxia of speech. J Commun Disord 2020; 87: 106026.

e118. Hayden D, Eigen J, Walker A, Olsen L: PROMPT: a tactually grounded model. In: Williams L, McLeod S, McCauley R, Hrsg. Interventions for speech sound disorders in children. Bal-timore, MD: Brookes; 2010. p. 453–74.

e119. Namasivayam AK, Huynh A, Granata F, Law V, van Lieshout P: PROMPT—intervention for children with severe speech motor delay: a randomized control trial. Pediatr Res 2021; 89: 613–21.

e120. Leonhartsberger S, Huber E, Brandstötter G, et al.: Efficacy of treatment intensity in German-speaking children with childhood apraxia of speech. Child Lang Teach Ther 2022; 38: 43–58.

e121. Birner-Janusch B: Die Anwendung des PROMPT Systems im Deutschen – eine Pilotstudie. Sprache-Stimme-Gehör 2001; 25: 174–9.

e122. Lauer N, Birner-Janusch B (eds.): Sprechapraxie im Kindes- und Erwachsenenalter. Forum Logop. Stuttgart: Thieme; 2010.

e123. Fox-Boyer AV: Aussprachstörungen. In: Grohnfeldt M (eds.): Grundwissen der Sprachheilpädagogik und Sprachtherapie. München: Kohlhammer 2014a; 175–83.

e124. Schulte-Mäter A: Therapieansätze zur Behandlung der Verbalen Entwicklungsdyspraxie. In: Fox A (eds.). Handbuch Spracherwerb und Sprachentwicklungsstörungen. Kindergartenphase. München: Urban & Fischer; 2013. 145–55.

e125. Beeson PM, Robey RR: Evaluating single-subject treatment research: lessons learned from the aphasia literature. Neuropsychol Rev 2006; 16: 161–9.

e126. Achhammer B, Büttner J, Sallat S, Spreer M: Pragmatische Störungen im Kindes- und Erwachsenenalter. Stuttgart: Thieme; 2016.

e127. Alfakiani MS, Siemons-Lühring D, Gietmann C, et al.: Wirksamkeit der Therapie für Kinder mit Sprachentwicklungsstörungen in verschiedenen Settings in Deutschland – erste Ergebnisse der randomisiert-kontrollierten Studie THESES In: 39. Wissenschaftliche Jahrestagung der Deutschen Gesellschaft für Phoniatrie und Pädaudiologie (DGPP). Leipzig 28.09.–01.10.23. Köln: German Medical Science GMS Publishing House; 2023 Doc V4. www.egms.de/static/en/meetings/dgpp2023/23dgpp07.shtml (last accessed on 12 December 2023).

eTable 1

Professional societies or organizations and elected representatives involved in the guideline
Publishing professional society: German Society of Phoniatrics and Pediatric Audiology, represented by Prof. Dr. med. Katrin Neumann

Professional society / organization	Elected representatives
Cochlear Implant (Re)Habilitation Working Group (ACIR)	Dipl.-Log. Karen Reichmuth
German Association of Paediatric and Adolescent Care Specialists (BVKJ)	Prof. Dr. med. Roland Schmid, Dr. med. Klaus Rodens
Professional Association Hearing& Communication (BDH)	Dr. phil. Markus Westerheide
Professional Association of German Psychologists, BDP and Department of Clinical Psychology	Prof. Dr. rer. nat. Dipl. Psych. Christiane Kiese-Himmel
Alliance of Child and Adolescent Rehabilitation (BKJR)	Dr. med. Monika Schröder
German Society of Audiology (DGA)	Prof. Dr. phil. Vanessa Hoffmann
German Educational Research Association (GERA | DGfE)	Prof. Dr. phil. Susanne van Minnen
German Society of Oto-Rhino-Laryngology, Head and Neck Surgery (DGHNO-KHC)	Prof. Dr. med. Christopher Bohr
German Society of Pediatric and Adolescent Medicine (DGKJ)	Dr. med. Cornelia Köhler
German Society of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapie (DGKJP)	Prof. Dr. med. Michele Noterdaeme, Prof. Dr. med. Dipl.-Theol. Christine Freitag
German Society of Pediatric Rehabilitation and Prevention (DGPRP)	Dr. med. Julia Hauschild
German Society of Phoniatrics and Pediatric Audiology (DGPP)	Prof. Dr. med. Katrin Neumann
The German Psychological Society (DGPs)	Prof. Dr. phil. Franz Petermann†, Prof. Dr. phil. Sabine Weinert
German Society for Social Pediatrics and Adolescent Medicine (DGSPJ)	Prof. Dr. med. Andreas Seidel
German Society of Special Education for Children with Speech and Language Disorders (dgs)	Prof. Dr. phil. Stephan Sallat
German-Speaking Society of Speech, Language, and Voice Pathology (DGSS)	Prof. i. R. Harald A. Euler, PhD,Dr. med. Sabrina Regele
German Children's Charity	Herr Heino Qualmann
German Professional Organization of Phoniatricians and Pediatric Audiologists (DBVPP)	Dr. med. Barbara Arnold, Prof. Dr. med. Christine Schmitz-Salue, Prof. Dr. med. Rainer Schönweiler
German Professional Association of Otolaryngologists (BV-HNO)	Dr. med. Joachim Wichmann
German Federal Association of Academic Speech/Language Therapy (dbs)	Prof. Dr. phil. Christina Kauschke,Prof. Dr. phil. Volker Maihack
German national professional association of Logopedics (dbl)	PD Annette Fox-Boyer, PhD, MSc
Society of Interdisciplinary Language Acquisition Research and Developmental Language Disorders in the German-speaking Countries. (GISKID)	Dr. phil. Katharina Albrecht
German-Speaking Society of Neuropediatrics (GNP)	Prof. Dr. med. Thomas Lücke
German Association for Special Needs Education (vds)	Prof. Dr. phil. Carina Lüke
Moderation and counseling	
Association of the Scientific Medical Societies (AWMF)	Prof. Dr. Dr. med. Ina Kopp

eTable 3

Areas of therapy and support for impairment of mainly pragmatic language (social-pragmatic communication disorders) (modified from 17 and e126)

Intrapersonal level: Understanding/recognizing	Interpersonal level: Producing/using
Communication behavior / conversation management	
– Knowledge of conversation and discourse rules – Recognizing turn-taking moments in conversation – Listening behavior – Advanced monitoring of language comprehension – Understanding figurative speech	– Improving and developing conversation / discourse management – Improving turn-taking skills – Dealing with topic changes and drifting – Repairs / revisions – Using figurative speech
Text processing and understanding	
Understanding texts / utterances – Understanding presuppositions – Recognizing inferences – Extracting meaning from oral and written texts (coherence / cohesion)	Producing texts / utterances – Adapting information content (presupposition) – Application of coherence / cohesion – Promoting oral and written narrative skills
Situational and contextual behavior	
Social interpretation – Understanding nonverbal aspects of communication – Understanding context clues (social context, e.g., social status, expectations; factual context, e.g., space, time, topic) – Understanding other people's thoughts and intentions (switching perspective) – Understanding social roles and relationships (e.g., friendships, groups)	Social interaction – Use of nonverbal communication – Using strategies to improve flexibility – Politeness, consideration, appreciation, and interaction in groups and relationships – Appropriate use of vocabulary

eTABELLE 2

Effectiveness and/or efficacy of a selection of interventions available in Germany for late talkers and developmental language disorders

Target group/disorder	Intervention	Effects, effect sizes[1]	Recommendations [2]
		Developmental language delay	
Late talkers (LTs); 3rd year of life	Early interventions in the 3rd year of life may stimulate vocabulary development, increase pleasure of speaking, facilitate the formation of syntactic structures, and enable children to catch up with children with typical language development	18: pre-post IG vs. CG: 11 studies, N = 275 e26: g = 2.33 (CI95 1.48–3.19) for expressive and g = 1.42 (CI95 0.68–2.15) for receptive language measures, g = 1.54 (CI95 0.80–2.29) for mean length of utterance, N = 36 e27: g = 0.88 (CI95 0.06–1.70) for communication developm. and g = 1.14 (CI95 0.30–1.99) for number of diff. target words, N = 25 mother-child dyads e28, 18: g = 0.61, CI95 -0.26–1.49 for number of diff. target words, g = 0.90, CI95 0.0-1.80 for mean length of utterance, N = 21	Early interventions **should** be used**
	Parent-centered intervention, e.g. Heidelberg Parent-based Language Intervention Parents are instructed and supervised by speech and language therapists to use language-promoting strategies in communication with their child and to reduce language-inhibiting forms of communication	19: pre-post, 18 studies, N = 680: parent-implemented language intervention has signif., positive impact on receptive & expressive language skills of LTs and children with DLD, with & without intellectual disabilities, g = 0.35 (CI95 0.05–0.65) to 0.82 (CI95 0.37–1.38) 20: pre-post: d = 0.72 (p = .017) to 1.16 (p < .001), N = 47 FU 0.5 yrs: d = 0.23 (p = .376) to 0.75 (p = .013), N = 47 e25: FU 2 yrs: d = 0.68 (CI95 0.06–1.3) to 0.75 (CI95 0.13–1.37), N = 43 e24: FU 7 yrs: d = 0.35 (p = .197) to 0.82 (p = .002), N = 68 e27: g = 0.88 (CI95 0.06–1.70) for communication developm. and g = 1.14 (CI95 0.30–1.99) for number of different target words, N = 25 mother-child dyads	For LTs with primarily expressive language delay, parent training **shall** be carried out first, as effectiveness is to be expected especially for children with age-appropriate language comprehension skills, followed by language monitoring and assessment
	Child-centered intervention (language therapy)	18: pre-post IG vs. CG: 11 studies, N = 275	Early child-centered intervention **should** be offered a) where there is a lack of improvement

	Intervention techniques focusing on language perception (input enhancement with very frequent presentation of target words & target structures) should be followed by techniques focusing on expressive language (stimulation of communication in interactive routines & recasting techniques)	e26: g = 0.73, CI95 -0.28–1.75 for expressive, g = -0.20, CI95 -1.18–0.78 for receptive language scores (both ns); g = 0.71, CI95 -0.30–1.72 for mean length of utterance, N = 16 e28: g = 0.61, CI95 -0.26–1.49 for communic. developm., g = 0.90, CI95 0.0–1.80 for mean length of utterance, N = 21	after parent-centered intervention in LTs with expressive language delay, b) for LTs with additional receptive deficits, c) in the presence of other risk factors, such as familial disposition for language disorders, low parental education level, low nonverbal cognitive skills
	Combination of parent- and child-centered interventions	18, 21: indirect proof of effectiveness	Child-centered intervention combined with parent training in cases with receptive deficits and/or the above named risk factors **may be considered**
		Developmental language disorder in general	
DLD	Speech and language therapy in general	14: 25 studies, N = 233; evidence of effectiveness for phonological (SMD = 0.44, CI95 0.01–0.86) and expressive vocabulary difficulties (SMD = 0.89, CI95 0.21–1.56), less for receptive difficulties (SMD = -0.04, CI95 -0.64–0.56), mixed findings for expressive syntax interventions (SMD = 1.02, CI95 0.04–2.01) No differences between clinician-administered interventions and interventions implemented by trained parents, and for group versus individual interventions (SMD = 0.01, CI95 -0.26–1.17) Involvement of linguistically typically developed peers in therapy has a positive effect (SMD =2.29, CI95 1.11-3.48) 15: N/A, receptive language also benefits from therapy 16: positive minor to major effects through speech, language, fluency, and voice therapy e85: N/A, language therapy works, at least in the short term; unclear whether long-term treatment successes for phonological skills and expressive vocabulary; mixed evidence for grammar production & language competence such as narrative skills; not	Children with DLD **shall** receive evidence-based, disorder-specific, parent- or child-centered language therapy Therapy **shall** promote age-appropriate language competence and performance and/or prevent negative psycho-emotional, social, cognitive, educational, and occupational consequences. Therapy **shall** be development-oriented and geared towards typical language development, individual developmental requirements of a child and any comorbidities A multiprofessional treatment plan **shall** be drawn up for language development disorder associated with a comorbidity. Age limits, including the corrected developmental age for premature babies, **shall** be considered. In addition to language therapy-specific approaches, interventions **should** also apply educational principles and those of learning psychology (e.g., reinforcement, prompting [behavior shaping technique, e.g., using verbal cues to encourage a target behavior], and

	Parent-implemented intervention in children up to 6 years Training parents to implement language and communication intervention techniques is associated with improved outcomes for children and increased parental use of support strategies; these strategies are effective in the long term for children with and without developmental abnormalities	proven effectiveness for severe receptive language impairments General language support without specifying a target structure results in nonspecific language progress at best In Germany, naturalistic therapy approaches are predominantly used; with such approaches, language progress is mostly slower than with approaches based on learning theory. 14, 15, e85: interventional studies on DLD were often heterogeneous & small, subject to plateau effects, and reported short-term outcomes based on various instruments and measures; hence, intervention results were often difficult to compare & generalize 35[3]: 76 studies, N = 5848, age 0;2–5 yrs, parent training usually as a naturalistic teaching approach or dialogic picture book reading Children with DLD, those at risk of DLD (premature birth, low socioeconomic status) & with autism spectrum disorder: signif. moderate association between parent training and child communication & engagement, & language outcomes (gm, 0.33, CI95 0.22–0.45) DLD: major effects for communication, engagement and language in general (gm 0.82, CI95 0.40–1.23) for language reception (gm = 0.92 CI95 0.07–1.76) and expression (gm = 0.83 CI95 0.38–1.29); medium effect for social communication (gm = 0.37 CI95 -0.1–0.93) Parents: strong association between parent training and use of language support strategies (gm, 0.55, CI95 0.33 0.78) Risk for DLD: moderate effects for language reception (gm = 0.28 CI95 0.00–0.60) and expression (gm = 0.22 CI95 0.04–0.41), engagement & attention (gm = 0.36, CI95 -0.10–0.83); greater effect for parent outcome (gm = 0.58 CI95 0.37–0.78)	shaping [behavior shaping using operant conditioning]). Outpatient, day-care, or inpatient treatment settings, individual or group therapy, intensive, interval or extensive treatment forms **may be considered** and shall be adapted to individual needs Bio-psycho-social conditions, potential excessive demands on the child, and other interventional side effects should be considered Therapy **shall** be ended on achievement of individual treatment goals or stable, (approx.) age-appropriate performance in speech, language, and verbal communication If the treatment goal is not achieved, multidimensional diagnostic assessment **should** be conducted, from which a treatment plan **should** be created (while observing the biopsychosocial model) Due to possible difficulties within the family and social environments of children with DLD and in their participation in educational opportunities, restrictions on activities and/or participation should be recorded and taken into account in DLD assessment, counseling and intervention planning on an interdisciplinary and multiprofessional basis

		Autism spectrum disorder: moderate effects for language reception (gm = 0.09 CI95 -0.08–0.27) and expression (gm = 0.19 CI95 0.02–0.36), social communication (gm = 0.21 CI95 0.05–0.40), engagement, & attention (gm = 0.55, CI95 0.26–0.83); greater effects for parental outcome (gm = 0.44 CI95 - 0.08-0.85)	
Developmental language disorders (without comorbidities)			
Phonological speech sound disorders (SSD)	Early therapy	24: pre-post IG vs. CG (age on starting therapy with Phonosens 3.6–5.5 yrs.): % consonants correct: d = 0.89, p = .01; reduction of phonological processes: d = 1.04, p = .01 without age effect (p = 0.09), N = 32	Phonological SSD **should** be recognized& treated early Intervention for phonological SSD **should** begin as early as 3 years of age With delayed phonological patterns (stagnant phonological processes), treatment **should** begin no earlier than 6 months after the age at which more than 90% of typically developed children have overcome these patterns
	Phonological & integrated-phonological therapy for phonological SSD with consistent word production PhonoSens (23, 24): integrated categorical perception of phoneme contrasts, production of target phonemes, auditory self-monitoring, & oral motor/oral sensory exercises	24: pre-post IG vs. CG: % correct consonants: d = 0.89, p = .01; reduction of phonological processes: d = 1.04, (p = .01), N = 32 FU 3-6 years (23): 11.5% spelling deficits in IG, 56% in comparable group, and 22% in age-matched normal population, N = 26	A phonological or integrated phonological therapy approach **shall** be implemented for a phonological disorder (stagnating physiological phonolog. processes &/or pathological processes) with consistent word production
	Psycholinguistically Oriented Phonology Therapy (P.O.P.T.) (25)	N/A	
	Patholinguistic approach (PLAN) (e86)	N/A	
	International treatment approaches	e87: d = 0.72 bzw. 0.69 (p jeweils < .05) f. Intensivtherapie 3x/Woche vs. Extensivtherapie 1x/Woche n. 8 bzw. 24 Wochen FU 4 months: greater conversational speech intelligibility, i.e., conversational articulatory precision, in children treated 4 months earlier than those treated later	

		e89: % consonants correct following tablet-based & traditional tabletop phonological one-to-one intervention exceeded that following natural language progress (p = .005, d = 1.3 and p = .001, d = 2.1, resp.), as did % vowels correct (p = .037, d = 0.81 and p = .175, d = 0.42, resp.), with no signif. difference between the two forms of therapy, N = 22 e90: computer-assisted phonological intervention & typical classroom practices in 4–5-year-olds improved the % consonants correct by +6.15 (p < .001) and +5.43, resp. (p < .001), & other phonological measures, with no sign. group difference (ηp2= .007, p = .368), N = 123	
	Therapy for inconsistent word production: target is consistent word production	e31: N/A, core vocabulary therapy is more effective for inconsistent word production than phonological contrast therapy, which is, however, more effective for consistent word production than the former (p = 0.001) FU 8 weeks: consonant accuracy achieved by the two forms of therapy was maintained, N =18	An approach aimed at consistent word production **may be considered** for phonological disorders with inconsistent word production (if phonological therapy approach primarily is not effective)
Note on phonetic speech sound disorders (articulation disorders, not belonging to DLD; errors, e.g., distortions & substitutions in production of individual speech sounds) such as distorted /s/ sound-production in the form of an interdental lisp, lateral <sh> production	*Van-Riper approach & modifications* *Traditional, motor-oriented articulation therapy; start regardless of secondary dentition*	*22: N/A, internationally widespread practical experience but a lack of evidence; no evidence for harm*	*A traditional motor-oriented approach (Van-Riper approach and its modifications) **should** be offered for purely phonetic (articulation) disorders* *Articulation therapy **should not** be provided as the sole or primary treatment approach for children with disorders other than phonetic SSD*
All SSDs	Non-speech tongue & oral-motor exercises	e91: non-speech oral motor treatment is not effective, 3 studies, N = 22	Non-speech tongue & oral-motor exercises **shall not** be applied

Lexical-semantic impairment	Vocabulary intervention(VI) Supports acquisition, expansion, & diversification of vocabulary elaboration of word meaning, semantic relations between words, word access Components: basic skills such as symbolic and categorization skills; exposure to target words selected according to linguistic criteria; elaboration of semantic & phonological word characteristics; elaboration of the structure of the mental lexicon; teaching of retrieval strategies Combination of implicit (input enhancement with selected target words) & explicit methods (exercises, metalinguistic instructions on word forms & meanings, direct teaching of acquisition & retrieval strategies; supported by visualizations & gestures; Table 1); provision of multiple production opportunities in various activities and contexts	28: 67 studies, 261 effect sizes, N = 5929, age up to 6 yrs. & school grades 1-3; signif. vocabulary improvement (g = 0.88, CI95 0.76–1.01) VI with major effect on word learning at ages ≤ 5 yrs. (g = 0.85, CI95 0.68–1.01) and 5–6 yrs. (g = 0.94, CI95 0.73–1.14) e92: VI in IG 1 with ”lexicon pirate” (lexical strategy therapy) & in IG 2 with “lexicon discoverer” (elaboration & retrieval therapy) for 3;9–4;9-year-olds, follow-up directly plus 6 & 12 months after intervention: signif. increased vocabulary (p <.0001, ηp2 = .723) in both IGs, larger vocabulary improvement for IG 1 (p = .034, ηp^2 = 0.085); IG 1 vocabulary also signif. larger than CG, which received general language support (p = .036); better generalization & longer lasting effects for IG 1 than for IG 2 (d = 0.57), N = 82 29: age 9;6 yrs. (SD = 0.23): expressive vocabulary signif. larger in small groups treated with VI than in CG with general language support (p = .039, ŋ2 = .039) Test outcomes: Forming analogies: IG signif. more effective individually or in small groups than CG (p = .001, ŋ2 = .176 and p = .038, ŋ2 = .068, resp.) Sentence comprehension: individual treatment in IG signif. more effective than in CG: p = .039, ŋ2= .036, n = 157 e93: age 9;11–15;11 yrs.; word finding in IG vs. waiting CG improved (d = 1.0, p = .04) FU 5 months: greater effect maintained for both groups after VI (d = 1.20, p <. 001), N= 15 26: N/A, 13 studies, N = 778, age 11;0–16;11 yrs., tentative evidence of effectiveness of phonological and semantic intervention approaches for enhancing	VI is effective for pre-school age & school age, **shall** be implemented from the age of 3 yrs. Previous early intervention **may be considered** for LTs with severely restricted vocabulary **Should be** terminated when age-appropriate lexical-semantic skills and reliable word access is achieved in everyday life Intervention targets shall be based on individual symptoms VI **shall** include word comprehension & production, incorporate different word categories (parts-of-speech), and create various opportunities for word use A variety of methods **should** be implemented FU assessment **shall** include standardized vocabulary tests, assessment of learning progress regarding target and control items, and structured observations of spontaneous word use Language support in educational contexts **should** be combined with VI and is recommended if mild residual symptoms remain after treatment Parents **should be** coached regarding language stimulation at home

		expressive and/or receptive vocabulary skills of adolescents with language disorder	
Grammatical (morpho-syntactic) impairment	Grammar intervention (GI): selection of targets for intervention according to individual symptoms & developmental sequences of typical language acquisition Sequential focus on sub-areas of grammar, not on grammar as a whole Effective components: input enhancement, conversational recasting, elicitation techniques to create speech production opportunities, using metalanguage / meta-linguistic approaches and visualizations *(Table 2)*	14: 25 studies; expressive syntax: d = 0.70, CI95 -0.14–1.55, receptive syntax: d = -0.04, CI95 -0.64–0.56, N = 233 30: 42 studies (no N provided), age 1;6–10 yrs.; recasting techniques provided a short-term mean effect size of 0.96 from 8 single d-values for proximal measures (early efficacy), CI95 0.76–1.17, and a long-term mean effect size of 0.76 for distal language outcome measures (late efficacy), CI95 0.46–1.06, for grammatical development, reflecting a positive benefit of approx. 0.5–1.0 SD e33: improvement in morphosyntax in children (age 3;0–5;11 yrs.) with impairments in both morphosyntax and phonology after 12 weeks of morpho-syntactic intervention vs. untreated CG: d = 1.19, p <.05 Cross-domain effects on phonological skills after morpho-syntactic therapy: d = 1.35, p = .01 compared with CG, N = 27 e34: strongest morphosyntactic improvement in children with DLD & phonological speech sound disorder (age 3;0–5;11 yrs.) with phonological and morpho-syntactic treatment alternating each week for 24 weeks vs. several other strategies: d = 1.06–1.55, p = .0018–.026, N = 47	GI is effective in pre-school & school age, it **shall** be provided GI **shall** be targeted at the child's main difficulties with language & communicative participation Interfaces between grammar & lexicon, phonology & morphology, morphology & syntax **shall** be taken into account GI **shall** focus on selected target structures introduced with regard to developmental sequences These effective methods (listed on the left) **should** be used, preferably in combination Combination and weighting of methods shall be individually adjusted according to factors such as age, awareness of the disorder, subject, & phase of therapy Implicit methods in particular **should** be used at kindergarten and preschool age Explicit methods **shall** be added with increasing age. Metalinguistic methods **shall** also be used to convey complex syntactic regularities, supported by symbols and visualizations appropriate for children
DLD with impairment of mainly pragmatic language (social-pragmatic communication disorders)	Treatment and support for social (pragmatic) communication disorders	e94: N/A, 8 studies: feasibility of different treatment procedures for social communication behavior; improvements in topic management skills, narrative skills & correction of inappropriate or ambiguous comments; no general recommendations can be deduced; N = 42	Placement of emphasis on communication behavior & conversational skills, text processing & text production, situational & contextual behavior **may be considered.** A distinction between the intrapersonal level (understanding & recognizing communicative-pragmatic information from the communication partner) and the interpersonal level (the individual's own production & use of communicative-pragmatic functions) is relevant.

DLD in bi-and multilingual children	Language therapy as with monolingual children Language mixing in multilingual families does not hinder DLD improvement (e40) Linguistic peculiarities in language acquisition that result from interference between the languages of multilingual children and are regarded as environmentally induced language difficulties are to be distinguished from DLD; despite their resemblance on the language surface, they do not require therapy, but language support (unlike DLD) (6)	31: N/A, vocabulary intervention in the second language of bilingual learners had an effect comparable to bilingual intervention on vocabulary growth only in that second language as bilingual intervention and, in the long term, on the conceptual vocabulary (the number of concepts a child knows, regardless of the language in which he or she knows the labels for those concepts); bilingual voc. intervention is signif. more effective on native vocabulary & in the short term on conceptual vocabulary t: Conclusion: voc. intervention conducted in the second (surrounding) language only promotes vocabulary development of this language, bilingual vvoc. intervention promotes both native and second-language vocabulary; N = 256 32: significant. progress of 2 IGs (monolingual treatment in the second (surrounding) language or bilingual treatment) vs. CG (no treatment) in vocabulary, not in syntax of the surrounding language for both monolingual and bilingual (parental involvement) therapy without group differences; conclusion: bilingual therapy with parental involvement could not create a sufficiently intensive bilingual context to make it superior to monolingual therapy; N = 29	Therapeutic approaches that have proven effective for monolingual children (see above) **should** also be used for bi-/multilingual children. ICF-based therapy, oriented towards the child's resources, **should enable** (re)establishment of activities, involvement of the cultural and linguistic living environment & thus improve social participation in education & society Whenever possible, all the languages of a child with DLD **should be incorporated** in the therapy (therapist, translator, parents) Parents **should be advised** to talk to the child in whichever language it feels comfortable. In the event of German language skills being insufficient for everyday life & educational contexts, additive support services &/or language support integrated into everyday life & lessons **should be offered**
Inpatient language therapy	Intensive, multidisciplinary, multimodal intervention on an inpatient basis as block or interval therapy	33: N/A, IG (inpatient therapy & at least 6-month FU) improved in comp. with CG (outpatient intervention at special-needs school with focus on language support) in speech sound production, grammar comprehension, lexical-semantic, & communicative-pragmatic skills, not in receptive vocabulary; N = 73 34: pre-post comparison of inpatient block therapy (6 weeks) vs. inpatient interval therapy (1 week & 2x2 weeks, each with 1 month break in between): both therapy approaches were roughly equally effective; major effects f. receptive language skills: (block	Inpatient therapy **should be considered** if clear, persistent deficits in language development & verbal communication, possibly also in the development of cognitive functions & psychosocial health & in the pre-school and school education situation of a child exist or are imminent, so that long-term effects on physical, psychological, &/or mental activities, general performance, employment, social integration, and participation are to be expected Therapy **shall be provided** by a multi-disciplinary team

		therapy: d = 0.89, CI95 0.72-1.05; interval therapy: d = 0.91, CI95 0.71-1.19), moderate effects f. expressive vocabulary (block therapy: d = 0.60, CI95 0.48-0.72, interval therapy: d = 0.79 CI95 0.61-0.98), minor effects for phonolog. processing (block therapy: d = 0.37, CI95 0.22-0.52, Interval therapy: d = 0.48, CI95 0.29-0.67); N = 184 e41: FU 12-16 yrs. after 6-week inpatient language therapy in childhood: 95.6% with regular school leaving 71 % Standard school-leaving certificate, 71% denied on-going language problems; N = 70		
	Training in language-promoting behavior for the parent accompanying the child during inpatient language therapy rehabilitation	see above at 19, 20, 35, e25	Parents **shall be advised and instructed** in language-promoting behavior towards their child during inpatient language therapy	
	Developmental language disorder associated with comorbidities			

e v e l o p m e n t a l l a n g u

	aged is order associated with comorbidi i

Intellectual disability, language-relevant syndromes, & multiple disabilities	Early, multidisciplinary, team-based, family-centered intervention, tailored to the child's cognitive & general level of development, possibly with the use of Augmentative and Alternative Communication (AAC) AAC for (severe) DLD for temporary or permanent compensation of impairments in spoken and written language skills, communication, activity, & participation	Parent-implemented intervention: see above, 19, 20, 35, & e25 e46: 12 studies, N = 659 families, treatment effects of the behavioral family intervention Stepping Stones Triple P for parents of children with disabilities Child problems: d = 0.54, CI95 0.37–0.70 Parenting style: d = 0.73, CI95 0.55–0.90 Parenting satisfaction & efficacy: d = 0.52, CI95 0.31–0.73 Parental adjustment: d = 0.73, CI95 0.55–0.90 Parental relationship: d = 0.42, CI95 0.21–0.63 Observed child behaviors: d = 0.52, CI95 0.20–0.85 e50: 50 single-case studies (all age groups) with 232 comparisons: Effectiveness of ACC interventions measured by behavior change using mPND: 44.8% high, 42.7% fair, 12.6% questionable or ineffective generalization: 75.3% high, 11.1% fair, 15.4% questionable or ineffective maintenance: 29.3 % high, 17.1% fair, 53.7% questionable or ineffective e95: 12 studies, N = 190, age ≤ 3 yrs.: ACC for children with disabilities; 7 studies provided conclusive evidence (PND as effectiveness measure): 37% of interventions were highly, 16% fairly, 16% questionably effective, 31% ineffective; overall, a slight majority of interventions (53 %) were highly or fairly effective e51: 54 studies, N = 111; ACC interventions are equally effective regarding challenging behaviors for a broad spectrum of interventions for people with disabilities; they are more effective for younger children than for adults, when using functional behavior assessment, & when functional	Children **should** receive early language intervention in line with their cognitive & general developmental level Language intervention **should** be communication-centered, take into account the child's developmental level & underlying etiology, be integrated into a comprehensive therapy & support concept, and be coordinated in a multidisciplinary treatment team Intervention **shall** be multidisciplinary, team-based, & family-centered Child- & parent-centered treatment **shall** be provided alongside a focus on parent counseling regarding interaction structure & responsiveness The aims **shall** be to improve communication and language skills and to maintain, create, & improve social participation Any prioritization of medical, therapeutic, & educational interventions **shall** be oriented towards their importance for the child's overall situation & the possible improvements in his or her body functions, activity, independence, social participation, & health-related quality of life Practical everyday skills & expansion of individual ways of communication **should** be central to therapy & support The therapy concept **shall** be oriented to the child's overall development, communicative participation, environmental factors, & language disorders/symptoms, which have been determined in a comprehensive diagnostic assessment of the child's phonological, semantic-lexical, morpho-syntactic, & pragmatic abilities	e s

		communication training is used instead of *Picture Exchange Communication System (PECS)* interventions. In general, moderate effects on expressive communication: - emerging language (n = 88): NAP .86 - prelinguistic abilities (n = 8): NAP .82 - multiword utterances (n = 11): NAP .70 and on the reduction of challenging behavior: - distracting (n = 27): NAP .89 - destructive (n = 84): NAP .88 - disruptive (n = 34): NAP .85 e53: 29 studies, N/A, descriptive evidence for improving expressive & receptive communication, functional communication behaviors, communication participation skills, interaction strategies, production & comprehension of symbols and multisymbols by using various AAC systems e54: 48 studies, N = 267: N/A, AAC interventions are effective at improving expressive communication e55: N = 68; vocabulary size for AC input & output methods & language therapy after 18th (language laboratory) & 24th session (the additional 6 sessions were parent-implemented at home) η2 = .47 and .41, resp. (p <.001); signif. better for AC methods than for language therapy e96: N/A; empirical evidence that sequencing of language therapy goals for individuals with developmental disabilities should be based on typical developmental sequence: (a) the majority of earlier emerging forms were acquired in fewer trials, (b) there were no cases in which the later emerging form was acquired & the earlier emerging form was not, (c) the majority of earlier emerging forms were produced correctly at higher levels than later emerging forms at FU after 6 months; N = 7	Therapy **shall** work on linguistic and non-linguistic target structures introduced in a logical developmental sequence Therapy of DLD and SSD **shall** use methods that are effective for children with DLD without additional disability (input enhancement, conversational recasting, elicitation techniques to create production opportunities, & metalinguistic/explicit instruction including visualizations*: Table 1*) In children with (severe) DLD and intellectual disabilities, syndromes, or multiple disabilities, ACC methods (unaided communication without equipment such as signing, body language, vocalizations, and aided communication using external tools such as assistive electronic & non-electronic communication aids) **shall** be used (in addition to or as alternatives to verbal language) Selection & organization of vocabulary in the ACC system **should** follow a common pedagogical & therapeutic concept and should take into account that children use core vocabulary more often than fringe vocabulary A multimodal communication approach (using various methods, e.g., verbalization, gesturing, using external communication aids) **should** be for the aim Combination & weighting of methods **should** be adapted to individual factors (age, awareness of the disorder, therapy goals, therapy phase)
Language therapy in children with Down syndrome & other forms of intellectual disability	e44: 8 studies; DLD intervention for Down syndrome: overall effect g = 1.01, CI95 -0.54–2.57, but hardly any transfer effects to untrained aspects of language; N = 141 for meta-analysis	Language therapy may improve speech and written language skills of individuals with Down syndrome and **shall** be used

e43: 11 studies; high-dosage interventions focusing on language and communication training in a naturalistic setting and are co-delivered by parents & clinicians may have the potential for positive outcomes for children with Down syndrome between 0 and 6 yrs. of age; N = 242

e47: children with intellectual disability (N = 64; age 18–27 months) received daily naturalistic, play-based early communication intervention using the Milieu Communication Teaching approach either 5x/week (high dose, IG) or 1x/week (low dose, CG); children with Down syndrome in the IG showed 300% larger vocabulary growth than those of the CG ($g = .55$, $p < .01$); children with other forms of intellectual disability of the IG also had larger vocabulary growth than those of the CG; in addition, children with Down syndrome (N = 35) of the IG showed more canonical syllable communication ($d = 0.77$, $p = .02$) and receptive vocabulary growth ($d = 0.76$, $p = .01$) (e48), both predicting later spoken vocabulary, than comparable children of the CG

Vocabulary growth in children with Down syndrome was three times slower under the above-mentioned intervention than in children with other forms of intellectual disability (e47)

e97: review, N/A; empirical evidence that communication and language phenotypes associated with 3 genetic disorders (Down syndrome, Williams syndrome, fragile X syndrome) predispose to specific profiles of strength and weakness in some areas of speech, language, and communication which should be considered when planning intervention

e98: 37 studies, N = 225; communication therapy for Down syndrome: behavior analytic strategies are promising for improving communication outcomes

Prompting & reinforcement: mPND 78%

Milieu teaching: mPND 84%

	Naturalistic language paradigm: mPND 100% e99: Effects of language and literacy interventions by teaching assistants (IG) vs. waiting CG in children with Down syndrome after 20 weeks of intervention: d = 0.23–0.54 (p ranging from ns to < .001) for single word reading, letter-sound knowledge, phoneme blending, and taught expressive vocabulary; after 40 weeks of intervention, the IG remained only numerically ahead of the CG on most outcome measures, but differences were not signif.; no transfer to other, non-trained linguistic skills; earlier therapy start, more therapy sessions, and better initial receptive language was associated with better language outcome; N = 57 e100: 18 studies, N = 427; age 2–24 yrs.; N/A: language intervention improves linguistic levels in individuals with Down syndrome & is a fundamental area of intervention throughout the lifes of these individuals	
Palatal plate plus language therapy for Down syndrome associated with significant orofacial dysfunction	e101: N/A; in children with Down syndrome, palatal plate therapy between 6 & 48 months of age, combined with speech and language therapy, has a positive effect on occlusion, oral motor function, facial expression, & speech/language; N = 37	In children with Down syndrome, palatal plate therapy **should** be attempted where orofacial disorder is evident
Language therapy for DLD in fetal alcohol spectrum disorder (FASD)	e102: classroom-based language and literacy intervention for nine-year-olds with FASD (IG) improved their phonological awareness and early literacy measures (d = 0.31–1.21, p ranging from ns to .001) compared with a FASD CG without intervention; N = 65	
Therapy of language and communication for developmental regression such as Rett syndrome	e103: 38 studies; N/A: interventions for developmental regression such as Rett syndrome have a predominantly positive effect on challenging behavior, communication, motor and play skills, especially if parents & teachers are involved; compensating for lost functions by developing new skills, e.g., through AAC, is more effective than	Speech-language & communication therapy **may be considered** for children with DLD associated with Rett syndrome

		restoring lost skills (e.g., regaining lost speech or motor skills); N = 132	
	Brain-computer interface & other teleintervention systems can compensate for severe communicative impairments	e104: 6 teleinterventions: N/A; speech-language teleinterventions in AAC device users resulted in an increase in participants' independent use of AAC devices during the intervention, higher satisfaction, and treatment acceptability with great potential for services for such individuals; N = 25 e56: 73 studies (N not stated): N/A; AAC brain-computer interface systems show promise for supporting communication in patients with severe language/speech and physical impairment but remain ineffective for some individuals	Use of brain-computer interface & other teleintervention systems **may be considered** for severe communication disorders
Autism spectrum disorders (ASD)	Therapy & encouragement of receptive, expressive, & pragmatic language: see S3-guideline of the DGKJP (German Society for Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy) & the DGPPN German Society for Psychiatry and Psychotherapy, Psychosomatics and Neurology) (36) <u>Receptive & expressive language</u> • Toddlers: recommendations 9-12, 31 • •Toddlers and school children with lack of language development (minimally verbal): recommendations 9-12, 31, 32, 33, 35 • School children, adolescents & adults with lack of (spoken) language: recommendations 32, 33, 35 <u>Pragmatic language</u> • •Toddlers & preschool children: recommendations 9-12, 31	36: see guideline	Recommendations from 36 **shall** be implemented for people with ASD & DLD Toddlers, pre-school children: comprehensive, low-frequency (approx. 2 hours/week), development-oriented, behavioral therapy techniques **should** be applied individually to support language; parents and, if possible, caregivers in kindergartens/other care facilities **should** also be involved in the therapy Aims: therapy involves encouraging the child's own initiative, training of basic principles of non-verbal communication (bringing, showing) & joint attention, of concept formation & symbol play, of linguistic & non-linguistic imitation; flexible practice of receptive language skills (vocabulary), natural reinforcement of spontaneous sounds (including stereotypical sounds) & successive reinforcement of expressive language skills; attention **shall** be paid to the generalization of skills at all levels (individual skills, contextual relationships, interaction partners); setting **shall** include therapist-based playful work with child & intensive involvement & guidance of parents: parents **shall** encourage the child's own initiative via non-directive, concrete, developmentally

	• School children & adolescents with intellectual disability recommendations 13, 32 • School children & adolescents without intellectual disability: recommendations 14, 31 • Adults with intellectual disability: recommendations 16, 32 • Adults without intellectual disability: recommendations 17, 31		appropriate play, interaction, & communication situations, including at home For the approx. 5 to 15% of people with ASD with only very reduced or no functional spoken language (minimally verbal, e105): encouragement of social interaction & communication plus additional intervention methods: Picture cards, speech-output devices with visual symbols & intensified imitation of words sung & rhythmically accompanied by drumming & clapping **may be considered** for preschool children From primary school age on, picture card systems or speech-output devices **should** be used at a cognitive developmental level; spontaneous communication **should** be foremost during the intervention If spoken language & picture card-based communication is not possible, individual gestures **may be considered**
Selective mutism	Psychological treatments, especially cognitive behavioral therapy and cognitive-behavioral techniques, such as stimulus fading, as well as different behavioral therapy techniques, e.g., exposure-based practices to defined anxiety situations, parent-based contingency management, operant methods, such as positive reinforcement of the target behavior of speaking, prompting, shaping, self-modelling, systematic desensitization; social skills training, language therapy, & pharmacotherapy, where necessary	38: 5 RCTs: psychological interventions vs. no treatment: overall weighted effect size g = 0.87, CI95 0.58–1.16; N = 233	Disorder-specific behavioral therapy methods **shall** be used in order to treat DLD associated with selective mutism , with the involvement of parents & educators / teachers plus language therapy in accordance with the child's speech/language deficits
Hearing loss	Training parents to implement techniques/strategies for language	e64: the quality of early caregivers' linguistic input influenced language outcomes of children who were	Family-centered (early) intervention **shall** be initiated on diagnosis of a hearing loss,

	learning (parent training, PT) that are predictively beneficial for child language development, given that quality & quantity of parental language stimulation significantly influences success of language development in children with hearing loss (e57); good evidence for children with cochlear implants (CIs) & hearing aids (HAs) These parental strategies include lively dialogic exchange, linguistic extensions, esp. morphological expansions, corrective feedback (recasting), responsive reaction to the child's actual focus of attention & interests with comments & descriptions, use of open questions, e.g., when looking at picture books; use of a conversation-enhancing rather than a directive communication style. Parent programs, included in family-centered interventions: Key component: improvement of parent-child interaction & use of beneficial parental communication strategies & support of language teaching strategies to reinforce the child's listening and oral language communication skills Parental programs that combine effective methods taken from interventions with children with normal hearing (in particular LTs), e.g., Hanen Program, with auditory approaches:	hard of hearing at age 3 yrs. (explaining 28.3% of variance in a regression model, p = 0.04); caregivers of children who were hard of hearing used a more directive communication style than caregivers of children with normal hearing, suggesting that some of these caregivers may need additional support to provide their children with an optimal language learning environment; children with hearing loss who were exposed to a greater proportion of directing utterances at 18 months had weaker language skills at age 3 than children who were exposed to a smaller proportion of such utterances) (r = -0.41, p = 0.03); N = 215 39: 27 studies with 22 populations, no N stated: strong effect of quality and quantity of parental linguistic input on child's language development within the first 4.5 years after cochlear implantation: r = 0.564, p ≤ 0.001, CI95 0.449–0.660, explaining 31.7% of the variance in child language outcomes Weaker & more heterogeneous effects of parental involvement in intervention (r = 0.380, p ≤ 0.052, CI95 0.004–0.667) & parental level of education (r= 0.117, p = 0.262, CI95 −0.087–0.312) e107: N/A; children with mild to severe hearing loss: performance in morphosyntax was more delayed than semantic abilities; better audibility with HAs was associated with faster language growth in preschool years; children fitted early with HA had better early language achievement than those fitted later; the language skills of children fitted with HAs after the age of 18 months improved depending on the duration of HA use; N = 402 e108: children with HAs (N = 180) compared with children with normal hearing (N = 80): no signif. differences at age 8 yrs. in word reading and reading comprehension except for poorer reading comprehension in children with moderately severe hearing loss (p = .003, d = 0.97), than in those with	Early interventions programs **shall** focus on supporting parents and families in offering the child high-quality dialogue & language in everyday life Parent coaching to improve parent-child interaction in terms of quality & quantity of language stimulation **should** be the main focus of early intervention Family-centered language therapy **shall** follow recommendations on parent programs & parent coaching & be carried out by qualified specialists (see below) Purely child-centered (language therapy) intervention without parental involvement **should** be avoided Family-centered language therapy **shall** be provided in addition to educational early hearing support where children with mild to severe hearing loss and no additional disabilities, who were fitted with HAs in their first year of life, score approx. 1.5 SD below the age norm of children with normal hearing on receptive & expressive speech/language tests at 2;0-2;5 years of age Children with persistent speech/language difficulties **shall** be offered child-directed language therapy from 3 years of age or younger, focusing on improving morphosyntax, phonology, vocabulary, and narrative skills Children with severe or profound hearing loss and persistent language difficulties, who have been fitted with HAs, **should** be assessed for possible CI-indication by phoniatric-pediatric audiological examination within a team experienced in pediatric CI care Family-centered listening & language intervention **shall** be offered after CI provision

	evidence is available regarding children with HAs or CIs aged between 3 months and around 5 years that the use of favorable language teaching strategies may be enhanced by parent coaching in parental programs (e.g., as individual or combined individual & group interventions) with short- & long-term effects on children's language development Available in Germany: Muenster parental program (e70)	moderate (p = .01, d = 0.88) & mild hearing loss (p = .06, d = 0.77) e78: children fitted with CI before the age of 2 years perform better on all language tests than children fitted later (p <0.001); bilaterally implanted children perform better than unilaterally implanted children in receptive & expressive language skills; N = 288 e58: children with hearing loss receiving comprehensive intervention: negative correlation between vocabulary outcome at 5 yrs. of age and age of enrollment (r = -.46, p < .01) & positive correlation with family involvement (r = .646; p < .01), which explained 35.2% of the variance (partial correlation r = .615; p < .001); best language outcomes occurred where early enrollment in intervention services was paired with high levels of family involvement; N = 112 e81: N/A; children with severe to profound hearing loss (age 48–87 months) who were fitted early with CIs (n = 48) or HAs (n = 47): where a subset of children were divided into performance categories, CI-fitted children were more likely to reduce the gap between their own expressive and receptive language development and that of their normal hearing peers in subsequent years, whereas this gap increased in children fitted with Has; N = 87 e79: children (age 9-36 months) with bilateral hearing loss; signif. improvement in vocabulary with higher number of language intervention sessions (β = 0.176 & 0.221, p < .001) for 2 subsequent measurement time points, underscoring the importance of early intervention; N = 210 e76: N = 19 children (6-24 months) with profound bilateral hearing loss: use of communication support strategies by mothers of a parent-implemented communication treatment group (IG) vs. a “usual care” (community-based early intervention) group (CG): mothers of the IG increased their use of communication support strategies by 17% (far larger	Children with CIs and no additional disabilities who were early wearers of HAs and were fitted with CI within their first 18 months of life can achieve accelerated language growth and (near-) age-appropriate language skills, comparable to children with normal hearing; however, some may have language-specific weaknesses in morphology, phonology, & narrative skills Such linguistic difficulties **should** be treated with symptom-specific language therapy (see below). Children with CIs and no additional impairments who develop slowly (no accelerated vocabulary acquisition; pace of language development corresponds “only” to the duration of hearing experience with CI) or very slowly (pace of language development is slower than the duration of hearing experience with CI) after CI fitting are at risk of acquiring no or limited communication skills via oral language alone. Such slower developmental progressions **shall** be recognized early & treated with symptom-specific language therapy

		than the CG) (d = 1.08, p = 0.04); children in the IG made significantly greater improvements in prelinguistic language skills than those in the CG (d = 1.09, p = .03) e74: N = 28 children with CIs +their parents: Parents of the IG (attended PT) showed greater improvements in sensitivity of response to their child, shared attention with the child & general conversational behaviors than CG, d values > 0.8 Children: significantly better language skills in IG than CG directly after PT and 3 years later, especially regarding grammar: d = 0.93, p = .019 e70: parents of the IG (attended PT) increased their responsiveness to vocal & preverbal signals (p = .002) and to the non-verbal signals (p < .001) of their child, and reduced their inappropriate initiative behavior (p < .001); no signif. improvements in CG; N = 29 parents, 24 children (age 3-12 months)	
	Intensive dialogic or interactive book reading with parents improves language performance of children with hearing loss (age 5-9 years), especially vocabulary	e69: parents of 28 deaf and hard-of-hearing children (age 5;2–9;1 years) practiced dialogic reading (IG 1) or typical reading (IG 2) or received no intervention (CG): vocabulary improvement in children of parents in IG 1 signif. surpassed that of IG 2 (p <. 05) & surpassed that of CG with marginal signif. (p = .057) and a great effect: η^2 = .276 e67: during joint book reading (JBR), parents of 45 HA-fitted children (mean age 25.8 months) showed signif. more literacy strategies (e.g., pointing to and labeling pictures and letters; p < .001, η2 = .10) & pedagogical techniques (e.g., elaborating on child ideas; p <.05, η2 = .05) than parents of 60 children with normal hearing (mean age 18.6 months); the frequency of JBR (p ≤ .05) & higher level parent facilitative language techniques (p ≤ .01) were positively & signif. associated with children's expressive language skills, similar to children with CIs	Parents **shall** be instructed in dialogic and interactive picture-book reading and reading aloud during language therapy and in its intensive use in everyday life

<u>Auditory-verbal therapy (AVT):</u> internationally widespread, family-centered intervention No robust proof of effectiveness due to lack of RCTs or high-quality NRCTs; study results suggesting positive developmental progression cannot be attributed solely to AVT & cannot be generalized without restriction	e65: 8 studies, N = 756, N/A: retrospective & longitudinal studies revealed signif. improvements in expressive language & auditory comprehension associated with AVT Greatest effectiveness on speech/language skills of children with CIs if their hearing loss was recognized early, they were provided with HAs or CIs, and they received AVT as early intervention (selection bias: good performers, motivated parents) Children who participated in AVT therapy can achieve language skills comparable with their normal hearing peers, and young children with CIs can achieve age-appropriate receptive vocabulary; AVT appears to contribute to integration in mainstream society e71: 14 studies, N = 676; N/A: children can learn to recognize words correctly, even with background noise; AVT can even help children with hearing loss beyond three years of age to achieve age-appropriate language skills and catch up with their hearing peers e74: children with CIs + their parents: evidence that the combination of AVT strategies with the adapted Hanen Program (PT, see above) & individual AVT methods (joint book reading, singing) are effective e66 (12 studies, N = 2349, N/A), e71 & e74 (see above): these and 2 other systematic reviews of AVT criticize the low quality of studies identified and cannot definitively conclude that AVT yields positive speech, language, & scholastic outcomes; N = 28	Family-centred (early) AVT **may be considered** for children after HA or CI fitting
<u>Natural aural approach (NAA):</u> Internationally widespread family-centered intervention approach, common in Germany No robust proof of effectiveness due to lack of RCTs or high-quality NRCTs; study results suggesting positive developmental progression cannot be	e80: NAA can help children with HAs & CI to improve receptive & expressive spoken language skills, but there were no outcome differences found in comparison with AVT & other family-centered methods; best results when NAA was offered to children with hearing loss who were detected early and provided with HAs or CIs as an early intervention (explains 14 % of variance) & where there was high	Family-centered (early) NAA **may be considered** for children after HA or CI fitting

solely attributed to NAA & cannot be generalized without restrictions Best results achieved when NAA was offered after early diagnosis of hearing loss, where HA or CI provision was offered as an early intervention, and where intensive parental participation was guaranteed	parental involvement (explains 20–33 % of variance), N = 42: e68: N/A; children who had early provision of CIs and who use communication modes with greater emphasis on oral language (AVT & NAA) had better speech perception & language outcomes than children using bilingual-bicultural sign and spoken language programs; age at implantation became the most significant factor for language performance; N = 39 e74: children with CIs + their parents: evidence that combinations of NAA strategies with the adapted Hanen program (PT, see above) & individual AVT methods (joint book reading, singing) are effective; N = 28	
<u>Language specific therapy</u>: children with hearing difficulties demonstrate language-specific problems, e.g., in morphosyntax, vocabulary, phonology, & narrative skills, for which no or no high-quality effectiveness studies on therapy methods are available in Germany to date		In the absence of evidence regarding the effectiveness of therapies for language disorders in different linguistic domains in children with hearing loss, evidence-based methods of language therapy for children with normal hearing **should** be adapted and used
<u>Training of narrative skills:</u> Narrative skills are often limited in children with hearing loss, even if their language performance is otherwise good; narrative skills have so far received little consideration in language therapy	e82: CI-fitted children (mean age 72.3 ± 5.1 months) who received intensive group (IG 1) or individual intervention (IG 2) with the *Narrative-based Language Intervention* (NBLI) method were compared with a CG who received conventional language therapy. In both IGs, microstructure (semantic/syntactic exactness: IG 1 η2 = .633, IG 2 η2 = .612, CG η2 = .119; complexity: IG 1 η2 = .738, IG 2 η2 = .551, CG η2 = .110) & macrostructure of narratives improved significantly and with large effect sizes compared to the CG (p =.008 for grammar and narration); N = 36	Narrative skills **should** be targeted for improvement during hearing and language therapy through intense individual or group intervention
<u>TALI (technology-assisted language intervention):</u>	e72: children (mean age 6.3 years, range 3–12 years) with mild to profound hearing loss & persistent language delay, fitted with bilateral HAs or CIs; IG	TALI **should** be offered to children with persistent slow progression in their auditory and language development, if available

iPad-based intervention with symbol-based communication strategies from AAC that aims to improve spoken language skills; software not yet available in German	received TALI, CG individual standard therapy; after the intervention, signif. group differences were found, especially for increases in mean length of phrases (β = .91 vs. .15, p < .0001), mean turn length in words (β = 1.21 vs. .26, p = .004), & number of different words spoken over time (β = 11.04 vs. 2.65, p = .007) in the TALI group; N = 41	
Music training / music-based therapy: children with CIs benefit significantly from continuous training in music & prosody (speech melody) perception; singing & playing an instrument are more effective than passively listening to music; younger children particularly benefit; musical-rhythmic intervention as part of CI rehabilitation is effective	e63 (10 studies, N = 186) & e109 (14 studies, n = 209): music training significantly improved musical perception (SMD = 2.092, CI95 1.33–2.85 (e63) & SMD = 1.779, CI95 1.33–2.22 (e109)); it was significantly more effective in children (SMD 2.658, CI95 1.64–3.68) than in adults (SMD = 1.118; CI95 0.014–2.21), more effective in users of CI alone (SMD 2.452, CI95 1.45–3.45) than bi-modal CI & HA users (SMD = 1.640; CI95 0.40–2.89), and more effective over ≥ 12 months duration (SMD 3.583, CI95 1.97–5.19) than ≤ 3 months (SMD = 1.791, CI95 0.95–2.63), and ≥ 3 to <12 months (SMD = 0.941, CI95 – 0.39–2.28) e109 (see above): Music training predominantly improved rhythm perception (SMD = 2.386, CI95 1.421–3.350) & pitch perception (SMD = 2.071, CI95 1.186–2.956), more than harmony (SMD = 1.673, CI95 0.466–2.880) & timbre perception (SMD = 1.376, CI95 0.586–2.165); prosody detection & discrimination also improved (SMD = 2.097, CI95 1.57–2.62) Music training was most effective for singing (SMD = 2.089, CI95 1.790–2.389), followed by playing an instrument (SMD = 1.891, CI95 1.646–2.196), with passive listening to music being least effective (SMD = 1.485, CI95 1.122–1.821) Training was most effective for the ages 0–3 yrs. (SMD = 2.922, CI95 1.992–3.853), followed by > 3 – 6 yrs. (SMD = 2.414, CI95 1.655–3.17), and > 6 – 12 yrs. (SMD = 2.107, CI95 1.3.46–2.869)	Training of musical-rhythmic components as part of active music-making, especially singing, **shall** be offered where possible in auditory & language rehabilitation for children with hearing loss, at least in CI rehabilitation

	<u>Auditory training using linguistic material and training of memory skills:</u> Studies support targeted performance with intensive training, but only partial transfer to other language & memory domains; tasks that utilize synthetic information processing (top-down processes) appear to be more effective than those that address analytical information processing (bottom-up processes)	e75: 9 studies, N = 95; N/A: training of auditory working memory, speech perception, phonological awareness, perception and discrimination of pitch & rhythm as well as identification & discrimination of environmental sounds and auditory scene analysis in children with CIs: all studies reported short-term improvements; the 4 studies with FU demonstrated retention of benefits & transfer of improvement to other domains e73: the working memory capacity of children with CIs improved better after training a digit span forwards (IG 1) or of backwards (IG 2) (forward: $\eta p^2 = 0.32$, backwards: $\eta p^2 = 0.45$, p each < 0.001) than an untrained CG, and remained stable after 5 weeks, but with no transfer to speech-in-noise recognition; N = 70 e77: Training with environmental, speech, music, and abstract sounds using the Sound in Hands auditory training strategy improved auditory processing skills (identification, discrimination, & auditory memory tasks) in children with CIs; improvement in auditory scene analysis did not reach significance; transfer to an untrained speech domain (phonetic discrimination) was best predicted by sound discrimination ($\beta = 0.48$, $p = .017$) & auditory scene analysis ($\beta = 0.41$, $p = .033$), especially so for younger children ($r = -0.7$, $p < .05$); N = 19	Intensive training of auditory-linguistic & memory skills with a focus on tasks involving synthetic information processing **may be considered**
Note on developmental verbal dyspraxia *(syn.: childhood apraxia of speech, CAS; speech motor planning disorder, not DLD)*	*<u>Internationally established:</u>* *Dynamic Temporal and Tactile Cueing (DTTC) (e110, e111)* *Rapid Syllable Transition Treatment (ReST) (e112–115)* *Nuffield Dyspraxia Program, Third Edition (NDP3) (e113, e114, e116)* *Prompts for Oral Muscular Phonetic Targets (PROMPT); prompts (e118, e119)*	*DTTC:* *e111: predominantly small effect sizes, with some moderate-to-large effect sizes (IRD = -0.20–0.84); N = 13* *e120: study on German-speaking children with 3-month FU: NAP for target structures 0.6–1.0 (predominantly large effects); N = 4* *ReST:* *predominantly large effect sizes e112: d > 0.82; N = 3*	*Children **should** receive speech intervention as early as possible. Intervention should include units of highly repetitive exercise in order to learn speech movement sequences.* *International approaches that have proven effective, such as DTTC, NDP3, ReST & PROMPT, **should** be applied as soon as they are available in Germany* *The treatment methods DTTC & VEDiT **may be considered** for German-speaking countries*

	<u>Approaches implemented with German-speaking children (no German manuals available):</u> *<u>DTTC (e120):</u> integral stimulation approach: children are encouraged to attempt a target in immediate imitation and work their way through a hierarchy of cues (auditory, visual, and/or gestural) towards independent and accurate utterances* *PROMPT (e121): tactile-oriented therapy approaches that use tactile-kinesthetic cues through manual stimulation of the face and neck to facilitate individual speech movements, in particular coarticulatory movements and thus oral-muscular target configurations* *VEDiT (e123, e124) is primarily based on multisensory associative learning by means of visual and tactile-kinesthetic cues for linking to the individual sounds, a phoneme-based manual system, repetitive learning of motor action sequences, successive approximation to target structures via simplifications, & the elaboration of a core vocabulary* *Other approaches using associative learning: concentration on visual aids via links (symbols, hand signs, graphemes) to the individual phonemes*	*e115; Cohen's d2 using weighted averages of baseline & FU variances formula according to (e125): 0.240–10.678 with predominantly large effect sizes; treatment delivered twice-weekly resulted in signif. retention of treatment effects to 4 months post-treatment and generalization to untrained but related speech behaviors; there may be a small but significant benefit from 4 times weekly therapy compared with twice-weekly ReST therapy; ANOVAS & Helmert planned orthogonal contrasts: no signif. differences in performance at different measurement time points in the maintenance phase; N = 4* *e114: d = 1.312 for articulation and prosodic accuracy with slight increase after 4 months of FU (d = 0.463), for generalization to untreated real-words after 4 months of FU (d = 0.250) and for untrained pseudowords (d = 1.376) posttreatment & after 4 months of FU (d = 0.586), for articulation and prosodic accuracy of connected speech (d = 0.443) & for decrease in inconsistency of repeated productions of untreated real words (d = 1.014) until after 4 months FU; N=26* *NDP3:* *e114: d = 2.162 for articulation and prosodic accuracy with slight decrease after 4 months of FU (d = −0.688), for generalization to untreated real-words after 4 months of FU (d = 0.250), and for untrained nonwords (d = 0.319) posttreatment & after 4 months of FU (d = 0.586), for articulation and prosodic accuracy of connected speech (d = 0.443), and for decrease in inconsistency of repeated productions of untreated real words (d = 1.014) until FU after 4 months; N=26* *e117: large pre-post effects for percentage of consonants correct (PCC) ($p < 0.01$, $\eta p2 = 0.49$) & percentage of phonemes correct (PPC) ($p = .04$, $\eta p2 = 0.31$), regardless of whether feedback comes from a therapist or computer*	*Due to lack of evidence, approaches designed in Germany such as TAKTKIN, KoART, TOLGS, or the McGinnis Association Method, and the Dutch Dyspraxia Program, based on the Nuffield Dyspraxia Program 1, which have been translated into German, **cannot be recommended**.*

	e113 (Cochrane): limited evidence that, with intensive use, NDP-3 and ReST may improve word accuracy in 4- to 12-year-old children with CAS, measured by the accuracy of production of treated & non-treated words, consistency of speech production, & the accuracy of connected speech; N = 26 *PROMPT:* *e119: in comparison with the CG, IG improved focal oral motor control by 6%, speech motor skills for probe words by ~9%, word-level speech intelligibility by ~8.5%, articulation from the 0.4. to the 2. percentile rank & reduced the severity of the speech deficit by 10% (from severe to moderate–severe)* *FU 10 weeks: ~31% intelligibility at the sentence level; N = 49 children with speech motor delay e121: N/A German study: single case, improvement in speech motor abilities* *VeDiT* *e123, e124: N/A: single-case study or small N*	

[1]Effects: e.g., language growth in intra-group comparison or cf. with control groups; effect sizes: in the event of missing data or absence of calculability (17): N/A, not available; (mean) Hedges g (gm), Cohen's d, SMD (standardized mean difference), other variables converted to Cohen's d if necessary; effect sizes of g, gm, SMD or d ≥ 0.20 are regarded by convention as small, ≥ 0.5 - 0.8 as moderate, and ≥ 0.80 as large; PND (percentage of nonoverlapping data) and mPND (mean PND): values > 90% are regarded as large, 70% to ≤ 90% as moderate, 50% to ≤ 70% as questionable, and ≤ 50% as no effects; partial eta squared: partial η2(ηp2) ≥ .01 to < .06 is regarded as small, ≥ .06 to < .14 as moderate, ≥ .14 as large effect; β = standardized partial coefficient: β > 0.1 small, β > 0.3. medium, β > 0.5 large; r = correlation coefficient: r = 0.1 is regarded as small, r = 0.2 as medium, r ≥ 0.3 as large effect; NAP (nonoverlap of all pairs): 0 to 0.65 weak, 0.66 to 0.92 moderate, 0.93 to 1.00 large effect; IRD (improvement rate difference): difference between the improvement rates of the treatment and baseline/withdrawal/maintenance phases

[2]Recommendations of the guideline (based on quality of evidence or clinical consensus): shall/shall not – strong recommendation, should/should not – recommendation; may be considered/ cannot be recommended– open recommendation; DLD, developmental language disorder; FU, follow-up; CI95, 95% confidence interval; IG, intervention group; CG, control group; LT late talker, RCT, randomized controlled trial; NRCT, non-randomized controlled trial, ns, not significant; N/n, number of participants; SSD, speech sound disorders

[3]Meta-analysis (35) rated gm after weighting higher than that stated under1

**The wording of the guideline has been slightly edited to improve comprehensibility and consistency.

Due to possible difficulties in differentiating phonological speech sound disorders from verbal developmental dyspraxia (childhood apraxia of speech, CAS) and phonetic SSD (articulation disorders) from phonological SSD, guideline recommendations for intervention in the latter disorders eTable 2 also contains (lines shown in italics).