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The devastating effects of language deprivation and misguided diagnosis on deaf children with cognitive and language disorders in medical centers, special needs, and educational settings

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1. Language Deprivation and Language Deprivation Syndrome (LDS)

The urgency of addressing language deprivation in prelingual deaf children cannot be overstated. Not only does it lead to language development disorders, but it also has profound negative effects on the entire neuronal development of the brain (Hall et al., 2017). The critical period of language acquisition is a crucial time for a child's cognitive and social-emotional development. Without proper intervention, language deprivation can lead to permanent brain damage at a neuronal level in adulthood. This lack of language stimulation, known as language deprivation, is a pressing issue that demands immediate attention (Humphries et al., 2016; Hall, 2017; Glickman & Hall, 2018; Wegner, 2024).

The scale of the issue becomes even more clear when we consider that current research suggests that a considerable proportion - possibly up to 70% - of children born deaf experience a lack of language input in the first years of life. They are in a state of language deprivation (Dougherty, 2019), which can range from severe to mild. This is a particularly prevalent issue for children with hearing parents (approx. 90%) who are only introduced to spoken language in the context of CI implantation.

The reasons for this lie primarily in the perspective of the hearing majority society, which classifies spoken and written languages as superior to sign languages on an institutional, individual, and cultural level. This classification is not based on a specific intention but on a history that places phonocentrism at the heart of most societies. Sign languages and their communities, completely unknown until a few decades ago, exist very marginally and are largely invisible to most people. Yet sign languages are functionally and linguistically a high-quality and powerful equivalent to spoken languages; they use a fixed, overly complex, and creative grammar, follow a visual, three-dimensional-scenic logic, and fulfill all requirements for abstract, theoretical, and concrete as well as social communication.

Since 2009, comprehensive newborn hearing screening has been conducted in Germany and, in case of a severe hearing impairment, parents are recommended CI fitting as standard. Many hearing parents want their child born deaf to be able to hear and speak like them one day and generally do not question the recommendations of (hearing) medical professionals.

The development of spoken language in children with CI implants is different for every child and may not be what the parents wanted or imagined. Hearing parents idealize spoken language, go to great lengths to bring it closer to their child and do not concern themselves further with the sign language, which is foreign to them and which they would have to learn as a foreign language. The acoustic linguistic input alone via the CI is not sufficient in terms of quality and quantity for natural language acquisition. Without natural, cognitively stimulating language input, as occurs almost automatically in hearing children, there is a risk of language deprivation. This also applies to children who were implanted early and undergo intensive hearing training (Szarkowski 2018; Hall et al. 2017).

Healthcare professionals and parents are so focused on speech acquisition that they do not recognize the damage that can be done to a child in the first years of life if insufficient acoustic speech input and no sign language over an extended period of time lead to a state of language deprivation.

There is an unknown number of deaf children who benefit little or not at all from CI treatment. These children often drop out of the efficacy studies conducted as part of CI research at an early stage. Hecht (2020) notes that to date, there is not a single well-designed prospective study that has proved the effectiveness of CI implantation for spoken language acquisition in a larger population of deaf children (see also Barnard et al. 2015). The lasting and life-changing effects of language deprivation have not yet been investigated in long-term studies, otherwise the devastating effects on the development of deaf children would have been brought to the attention of medical and educational professionals and consequences would have been drawn.

Unfortunately, it must also be noted at this point that the situation for CI children at HK special schools has been deteriorating for several years. Increased children of deaf parents with sign language skills are now attending mainstream schools with interpreters, meaning that language-deprived CI children no longer get high-quality sign language communication with their peers in the school playground. Most teachers at HC schools are unable to provide quality language input in DGS due to a lack of sign language skills, so the CI child still is trapped in a state of language deprivation and is unable to acquire any of the languages on offer naturally through communication with peers or teachers.

To this day, HK schools generally teach using spoken language in combination with sign language support. Speech-supported or speech-accompanying communication (LUG or LBG) is a kind of "broken German" and tends to be detrimental to the development of a sign language system, as the individual signs used to go with DGS are processed visually and gesturally rather than linguistically. This hinders the development of a coherent sign language semantic network based on visual-spatial grammar. A linear sequence of accompanying gestures has a 'language-slowing or language-delaying' effect (Rozen-Blay, 2022), as the mixing of individual elements of different language systems (written language, spoken language, LBG, LUG and DGS) leads to a dissonant or semantically incoherent form of language acquisition - also at a neuronal level - and impedes both the development of spoken language and the development of DGS (Schick et al., 2011).

The spoken and written language environment of the HK schools, which is difficult for deaf children to access, has developed even further into a language-deprived environment due to the absence of many DGS-competent children who are now taught in mainstream schools, with the corresponding negative effects on cognitive-social development.

The severity of the lack of fully accessible linguistic input correlates with a late and reduced establishment and structuring of the neuronal system in the brain (Cheng et al., 2023). The more language deprivation in childhood, the less intellectual (cognitive skills) and emotional-social skills (theory of mind) develop in the child (see Fig. 1).

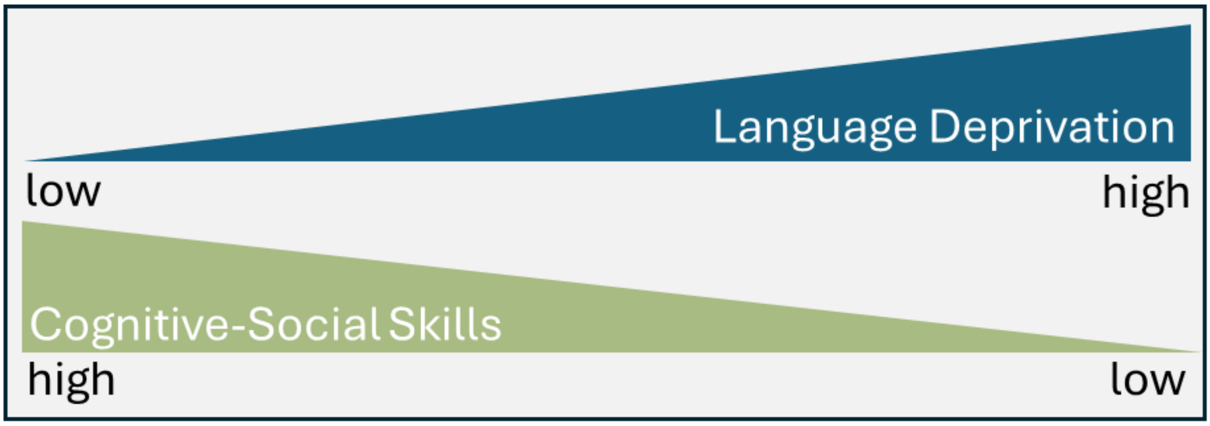

Fig. 1: Inverse proportional relationship between language deprivation and the development of cognitive-intellectual abilities and social-emotional skills.

Language deprivation in early childhood leads to complex neurodevelopmental disorders that can manifest themselves in a variety of symptoms in children. If left untreated, these disorders can lead to so-called[1] **language** deprivation syndrome **(LSD)** in later adulthood (Gulati, 2014, Language Deprivation Syndrome, LDS), which, according to current research, is irreversible.

Functional neuroimaging studies on adult deaf people with language deprivation were able to prove a characteristic organization of cortical structures in the brain (Mayberry et al. 2011), which particularly affects language-relevant brain regions. Cheng et al. (2023) showed that when the human brain matures in an environment with insufficient language stimulation, it shows overall reduced cortical growth (up to 30% less gray matter) in specific brain areas associated with language, memory, empathy, problem-solving, and attention. The reduced volume of gray matter is linearly related to the duration and extent of language deprivation to which the child is exposed.

This means that Language Deprivation Syndrome (LSD) is a permanent, socially induced, life-altering cognitive disability that rarely occurs in hearing people but, according to Gulati (2019), has reached epidemic proportions in the deaf population since the end of the 20th century. The medical treatment method of CI implantation, which is often characterized by a lack of appreciation for sign language, as well as the acceptance of practices on deaf children that

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[1] LSD has not yet been recognized as a diagnosis in the ICD classification systems.

actually violate all rules of medical ethics, have led to a catastrophic development in children born deaf that is irreversible in the long term in adulthood (Hecht, 2020).

LSD encompasses a range of disorders of higher cognitive functions and social-emotional skills. Impaired is the recall of factual knowledge and temporal sequences of events, attention, and working memory, abstract thinking and understanding of cause and effect, mood regulation, and overall executive functions, as well as language skills (Hall et al., 2017).

Complex cognitive abilities such as pattern recognition, sequential memorization, sustained attention, and the ability to empathize with others can only develop adequately if the brain is successfully stimulated by language to semantically encode perception-based environmental impressions, link concepts with each other, structure them, and flexibly regenerate them in the long term (Kral et al. 2016).

If this is not successful, the symptoms of LSD are so pronounced in some of those affected that independent living is significantly impaired or almost impossible. In all Deaf Mental Health support systems and in psychiatric and psychosocial institutions, these cases occur as "system crashers" who repeatedly and significantly challenge the norms and structures of various systems designed to support and manage them, such as welfare services and other social institutions. These adolescents often display severe behavioral issues that make it difficult for these systems to manage them effectively.

The symptoms affect the areas of 'knowledge,' 'behavior,' 'language,' and 'thinking' but can vary greatly from person to person. Not all symptoms are always present, but if a certain critical number of the symptoms mentioned can be diagnosed, Gulati (2019) speaks of a language deprivation syndrome (LDS).

Thus, LDS is a neurological and developmental disorder that affects how people interact with others, communicate, learn, and behave. LDS is diagnosed at an adult age and refers to a wide range of symptoms and severity based on language deprivation in childhood. (see Fig. 2).

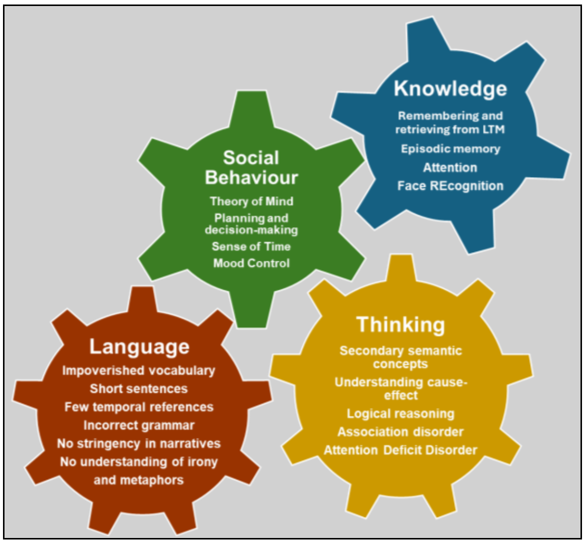

Fig. 2: Language Deprivation Syndrome spectrum disorder

It is not uncommon for people with language deprivation syndrome to develop severe mental illness as a result of their symptoms, making them dependent on treatment and support for the rest of their lives (Glickman, 2018). Counseling centers, deaf associations, psychotherapeutic practices, social services, assisted living outpatient clinics, and legal guardians meet numerous deaf people with LDS who are difficult to communicate with and sometimes difficult to regulate in their behavior and thinking (Wegner, 2024).

After leaving school, language-deprived adults fall outside the purview of educational institutions and become dependent on an extensive support system funded by the state and social services. The institutions involved, such as the medical community, support centers, and special schools, as well as educational institutions (universities and colleges) and the professionals working within them, do not feel responsible for the devastating effects of language deprivation. ENT specialists and other professionals are largely unaware of their role in this development. Instead, they tend to view the poor academic and social performance of deaf children as a direct consequence of their hearing impairment.

Society is not yet aware of how important a first language (L1) is for cognitive development, and that a pronounced lack of language in children in the first years of life leads to neuronal dysfunction of the brain and, thus, to a cognitive disability.

Humans are born with around 100 billion neurons, which form a massive number of connections to other nerve cells during normal development, especially up to toddlerhood. Under the influence of sensorimotor experiences and linguistic stimulation, the initially abundant neurons network set up themselves into adaptive neuronal circuits. If there is a lack of adequate linguistic input during this crucial time, the structures in the brain that are designed for language do not develop or develop inadequately.

The structural formation of neural networks in the brain through language is modality-independent, at least with respect to the functional connections between the inferior frontal cortex and the superior temporal cortex. Regardless of whether the language is manual-visual (sign language) or vocal-auditory (spoken language), structures for processing linguistic information are formed through language stimulation, enabling the child to generate semantic concepts for understanding the environment and communicating with caregivers.

Hearing impairment alone is not the cause of brain dysfunction or a developmental disorder in children. Deaf children with deaf parents who have high-quality access to Sign Language from birth develop cognitive and social skills in the same way as hearing children with hearing parents who have high-quality access to Spoken Language from birth.

Neuroimaging studies indicate neurostructural differences in deaf adults that correlate with the timing and quality of early language acquisition of the first language (L1) (Hall et al., 2017). In addition, studies show that a high-quality first language is essential for the normal development of cognitive abilities, theory of mind (Woolfe et al., 2002), working memory (Marshall et al., 2015), and executive functions (Botting et al., 2017). This applies to any language, regardless of whether it is a spoken language or a signed language.

Sign languages around the world, like currently existing spoken languages, stimulate full natural language acquisition and related cognitive brain development (Hall et al., 2017; Mayberry et al., 2011; Mayberry & Kluender, 2017; Schick et al., 2007). Although Sign Languages do not exist in written form (apart from transcription systems), early sign language exposure has been shown to improve literacy with respect to a written L2 language based on a spoken language, especially in CI-implanted children (Davidson et al., 2014). This is because the brains of deaf children who receive sign language stimulation start to generate the semantic concepts, they need to get L2 literacy skills.

At this point, however, it should also be pointed out that there are structural weaknesses in our society and education system in the provision of sign language input and environments. There are too few further education and training opportunities for deaf sign language teachers and, therefore, too few providers of home sign language courses. Willing parents meet a lack of resources in the sign language communities and need a high level of commitment to find their way in a different language modality.

The most important basis for literacy is an extensive coherent network of semantic concepts to understand the messages conveyed through writing. Children's earliest experiences with writing through phoneme-grapheme mapping via the finger alphabet, are motivated by meaning (semantic concept) and not by sounds or letters. Language cannot be equated with "speaking" or "communication", but all languages in this world are linguistic de- and encoding systems that are produced and shaped by human communities and are constantly reshaping or recalibrating. On the one hand, our biologically determined neuronal networks in the brain shape the language systems and language processing with regard to the timing, type, and scope of information encoding and, on the other hand, the incoming linguistic impulses of a language system reshape, structure and functionalize the determined neuronal structures of a maturing child's brain and constitute specific connections and patterns in the cortical system of linguistic thought.

The literacy of a language influences the linguistic system as such. The knowledge that has been written down can be better remembered and thus made "durable" for a society. In spoken languages, this is achieved through the system of phoneme-grapheme mapping. Sign languages, which are articulated three-dimensionally in space, have not yet been written down to any significant extent.

As literacy is highly valued in our society and is extremely important for our education system, non-written sign languages are seen as inferior and are still regarded by many teachers as a kind of auxiliary or support system. However, the genius of a writing system is not the alphabetization of spoken language but the fixation of knowledge through an external medium. This gives languages more standardization and enables society to store and remember information and knowledge on a large scale.

Today, this is also possible with digital media, and deaf people use this new way of producing and recording sign language texts by posting their narratives as videos on the Internet to make them visible and available to the community over a longer period.

The importance of the cultural techniques of reading and writing is still central to the acquisition of knowledge in our education system. However, their use and the way in which their own literacy skills are combined with external KI tools could potentially change in the future. KI tools are currently being developed that make it easier for listeners to retrieve knowledge, simplify the writing of texts, improve their style, translate them from one language to another and correct them grammatically and formally. This means that people need to get basic reading and writing skills. Building on this, they can use various Ki tools to improve the style, spelling, and structure of their writing. Deaf children should spend more time understanding the semantics of the world than being able to write words and sentences down correctly.

Nonetheless, reading and writing skills are important for deaf people to cope with the spoken and written language-oriented society around them. The more literacy deaf people get, the easier it will be for them to partially compensate for phonocentric barriers (e.g., speech recognition apps, subtitles, information sheets, newspapers), and the more successfully they will be able to use AI tools.

Given the enormous attention that has been paid to achieving correct reading and writing skills over the last century, it is now time to reflect on the importance that certain aspects of these skills will have in the future. The semantically correct decoding of written messages will probably always be important. However, when it comes to the correct grammatical encoding of messages, deaf people can benefit enormously from the developing writing, translation and formulation tools of AI.

However, to fully benefit from the new AI tools, both deaf and hearing people must first understand the world, i.e., grasp the meaning of linguistic formulations on a semantic-conceptual level. A lack of neural connectivity and structuring in the cognitive system is difficult to compensate for - at the latest after puberty - so the use of AI tools to support writing processes may become difficult.

Overall, language deprivation has a negative impact not only on the acquisition of knowledge at school but on all areas of child development. School maturity, regulation of feelings, development of social skills and the ability to build emotional relationships with peers, and finding one's own identity all depend on language skills. This makes language-deprived deaf children particularly vulnerable to other factors that may also have a negative impact on the child's social-cognitive and psychological development. These include the educational and migration background of the family, social class, financial background, mental illness, and other stressful situations within the family.

For example, a child's environment and support options are also crucial for the effectiveness of a cochlear implant (Kim et al., 2010). Follow-up care after CI surgery is lengthy and emotionally and physically demanding for implanted children and their families (Tucker, 1997). If parents do not make a strong commitment to support the child in phonological development after CI implantation through auditory-verbal therapy, evaluation of hearing and speech development, and regular adjustment of the speech processor, problems with phonological development may occur, and the implant may even be almost ineffective (Hyde et al., 2011). This may be more harmful to deaf children with a CI implantation because once a CI is implanted, it cannot be removed, and children may fail to acquire both spoken and signed language (Zimmerman, 2009).

Medical professionals who urge hearing parents of a deaf child to communicate exclusively in spoken language with their CI-implanted child to ensure supposedly more efficient hearing and language development in Spoken language are acting negligently and irresponsibly - often without realizing it. The individual and societal consequences of this misinformation about a child's language development are devastating and urgently need to be clarified by medical professionals. When a child lacks high-quality language interactions and communication experiences that are essential to a child's language development, the functional effects of moderate to severe language deprivation are perceived by outsiders as a cognitive disability and are often misdiagnosed as such in pedagogical-audiological centers or special schools and other causes are used to explain it. As a result, the wrong type of school recommendation and support measures are given.

In fact, insufficient or no language input triggers a socio-culturally induced neuronal developmental disorder (Hall et al., 2017), which can be described as a form of 'neuronal' physical injury and results in a cognitive disability. This is a violation of the right to physical and mental integrity[2] and can, therefore, be considered a risk to the child's welfare[3] (Löffelholz, 2017).

2. Current diagnostic practice in pedagogical-audiological counseling centers and special schools in Germany

Deaf children who are treated in pedagogical-audiological centers in Germany are often diagnosed with a learning disability, a general developmental disorder, a language development disorder, and/or social-emotional abnormalities. Developmental or school maturity tests, intelligence and perception tests, hearing and speech tests and performance tests are used for diagnosis. Clinics, ENT doctors, speech therapists, and health authorities often refer to these services of the free pedagogical-audiological consultation centers.

Comprehensive diagnostics and medical history taking are usually conducted by people who are trained and skilled in conducting and evaluating audiological hearing screenings, but who have little knowledge of test theory or the construction of psychological test procedures for testing cognitive performance or speech and perceptual development. They are often unable to adequately assess the stated quality criteria of 'objectivity,' 'reliability',[4] and 'validity'[5] of the procedures, as well as how the norm values of different norm samples and the level of

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[2] Article 3 of the Charter of Fundamental Rights of the EU. http://fra.europa.eu/de/eu-charter/article/3-recht-auf-unversehrtheit

[3] https://biling-ev.de/die-sprachliche-deprivation-tauber-kinder-bedeutet-eine-kindeswohlgefaehrdung-nicht-die-erziehung-in-dgs/

[4] Reliability (accuracy or dependability) means how precisely the characteristic is measured or whether the measurement results are subject to too much error.

[5] Validity (validity) indicates whether a well-founded diagnostic decision with corresponding quality can be made based on the measured test value for a child.

difficulty of the individual test items are arrived at. A look at the course content of a degree course in 'Hearing Technology and Audiology' or 'Education of the Deaf' makes it clear that the topics of 'Test Theory' and 'Test Construction' are not included in the modules of such courses.

Most psychological test procedures are developed by hearing psychologists and are evaluated and standardized for specific needs and target groups. Without knowledge of the construction of the test procedures, their quality criteria, the validated target groups as well as their usefulness, test fairness, test economy, transparency, and falsifiability, errors can occur in the selection and application of test procedures and in the interpretation of test results. Furthermore, misguided diagnostics can lead to a misdiagnosis and, thus, to an inappropriate assessment report to determine special educational needs.

When a psychological test used in a duty of care context does not meet the psychometric standards of objectivity, fairness, reliability, and validity, several significant legal and ethical consequences can arise. Inaccurate test results can lead to incorrect diagnoses, causing inappropriate or harmful treatment plans, and the lack of fairness can result in biased outcomes, leading to discrimination against deaf communities. Deaf children who are negatively affected by the test results may sue for damages or discrimination because their rights are violated. Institutions or professionals who rely on unsound tests risk damaging their reputation and credibility.

Unfortunately, there is currently no specific legal regulation that stipulates who may conduct a psychological test on deaf children and adolescents and under what conditions. However, the general duty of care applies to every person who conducts tests. To meet this duty of care, only those who have the relevant skills and can provide evidence of proper training should be allowed to use and conduct psychological testing procedures.

Especially in the case of vulnerable groups such as deaf children, where the general duty of care is often violated because psychological testing procedures are used that have neither been designed, evaluated, nor standardized for deaf signers and often provide only for spoken, not for signed language instructions, a legal regulation would be urgently needed. The resulting damage without legal regulation can be devastating for deaf children in the long term.

A case study from the year 2023 will illustrate this below.

3. Case study: Deaf child with a diagnosis of intellectual disability

This is a 6-year-old prelingual deaf child who is due to start school in 2023. The special educational service of an education center with a focus on hearing should clarify whether the child has special educational needs, and which support measures are necessary or which type of school is suitable for a successful school career. For this purpose, a report was drawn up based on extensive testing, observations, and expert opinions, which we will refer to below.

After his birth in 2017, the child was initially fitted with hearing aids on both sides and, at the age of 4, with cochlear implants on both sides in 2021. It is not clear from this report why and how this decision was made. Both parents are hearing impaired themselves and live separately. The child lives mainly with the mother, who communicates with the child using spoken language and sign-supported German. The father signs German Sign Language with the child, although it was not found how often the child is with the father and how competent the father is in sign language.

The parents of the child presented here are of the opinion that speech production and comprehension are not developed in an age-appropriate manner. It remains unclear which of the two languages (German Sign Language or German Spoken Language) the parents are referring to. At the age of three, the child was admitted to a bilingual kindergarten and received early support in spoken language. It is not clear from the report to what extent high-quality early Sign Language support was also provided. The child also received speech therapy (German spoken language) and occupational therapy.

In 2022, the ENT clinic diagnosed the then 5-year-old child with bilateral hearing loss bordering on deafness, limitations on all linguistic levels and a pronounced speech development disorder. Presumably for German spoken language, although this is not explicitly stated in the report.

The child's speech development disorder was diagnosed using the **speech development test for two-year-old children (SETK II)**[6] in the ENT clinic. The SETK II is designed for 2-3-year-old children with developmental disorders such as sensory disabilities, intellectual disabilities, and autism and enables the assessment of receptive (language comprehension) and productive (active speaking) language processing skills in German spoken language.

When reviewing the SETK II test quality criteria, it was found that the reliability of the sub-tests on language comprehension is insufficient (.61). Data from 218 hearing children were included in the standardization for age group II. There is no breakdown by gender and bilingualism.

An objective, reliable, and valid test cannot be assumed for the testing of the child described here with the SETK II. The test instructions and the entire test were given in spoken language, which the child could not hear (the results of the audiometric test procedures revealed a hearing loss bordering on deafness) and, therefore, could not process the instructions and test items linguistically. It is unclear whether the child understood the standardized spoken test instructions. This means that the criterion of objectivity is not met, as the child's understanding may depend on the communicative abilities of the person conducting the test.

In the language comprehension subtests, the child was presented with words and sentences in spoken language and asked to select the corresponding pictures. In the speech production test, pictures were presented, and the child was asked to name the pictures in spoken language or describe them in sentences. The person conducting the test asked specific questions in German spoken language. The questions were intended to provide support and motivate the child to produce sentences in German spoken language.

As the deaf child cannot perceive spoken instructions, sentences, and questions by hearing, it cannot know what it is supposed to do, even with spoken language support through questions.

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[6] https://www.biss-sprachbildung.de/btools/sprachentwicklungstest-fuer-zweijaehrige-kinder-setk-2/

A test implementation with a resulting reliable scientific measurement of the child's language competence can by no means be assumed here.

A lack of objectivity and reliability has an impact on the validity of a test procedure. In age group II, the test results of 218 hearing children aged between 30 and 35 months were used for the validation and standardization of the SETK II. The construct validity of the SETK II was determined based on the correlation of the test results of hearing children in the subtests and the convergent validity from the correlations of the test results of the hearing children with the subjective assessments of the hearing parents. Hearing status or bilingualism played no role in either the convergent validity or the construct validity.

There is no separate standardization for children with CI implants or for deaf children whose L1 is German Sign Language. For the latter, the SETK II would not only have to be re-normed, but also translated into German Sign Language. For such a translated foreign language version, the difficulty indices of the individual test items would also have to be recalculated, which would presumably also change the selection of test items.

Overall, it can be said that the SETK II should not have been used in the case study presented here. In 2022, the ENT clinic diagnosed bilateral hearing loss bordering on deafness and limitations at all linguistic levels so that the understanding of spoken language task instructions is impaired or not possible.

The SETK II did not measure the child's comprehension or production of German spoken language, but only how well or poorly the child can perceive instructions in German spoken language or how well the child can process information through lip reading.

A psychological test procedure may only be used if it is suitable as a decision-making aid and meets the criteria of suitability, necessity, and reasonableness (principle of proportionality). This criterion is met if the methodological requirements of the quality criteria of objectivity, reliability, and validity developed by psychological diagnostics (see above) are fulfilled. The principle of proportionality was not met in the case study presented here.

The use of test procedures with spoken language instructions and test items should not be used with deaf children who are unable to process spoken language test content sufficiently auditorily. If the test procedure is nevertheless used, this could be a violation of the child's personal rights. Audiologists and educators who diagnose in their institutions should be aware of the latter.

In addition to testing with the SETK II, the medical history also included assessments by early intervention staff. Whether these were systematically collected, and the staff were trained for this remains open. The early intervention team assessed the boy's language comprehension in both spoken and sign language as not age appropriate. Disorders in cognition, communication, motor skills, and language are also mentioned. These assessments were confirmed by speech therapy and occupational therapy specialists and supplemented by the added statement that the child often only understands prompts and questions using individual keywords, if at all.

Based on the results from the ENT clinic in 2022, the 'hypotheses' for the new assessment in 2023 were that the boy did not have age-appropriate hearing development, that he did not speak and sign in an understandable and age-appropriate manner, and that his cognitive abilities and motor skills were not developed in an age-appropriate manner.

A variety of methods were then used to evaluate these hypotheses. Audiometric tests, which, as noted in the report, were either not possible or conspicuous in several areas, parental questionnaires in written German (note: L2 for the hearing-impaired parents), and various reports from early intervention, speech therapy, and occupational therapy were evaluated. In addition, audiometric speech tests such as the Oldenburg Children's Sentence Test (OLKISA) and the Göttingen Children's Speech Comprehension Test II were used, but neither could be conducted nor evaluated. This means that the speech intelligibility threshold of the 6-year-old child could not be figured out. This suggests that the 6-year-old was unable to perceive any simple sentences (OLKISA) or monosyllabic words (Göttingen Children's Language Comprehension Test II).

Developmental abnormalities at preschool age were assessed using the **BUEVA III,**[7] and intelligence using the **SON-R 6-40**[8]. As the instructions for the BUEVA III are also given orally, a lack of objectivity and reliability must also be assumed here. Due to the child's low hearing ability, it cannot be assumed that it has understood the verbal instructions.

BUEVA III is a psychological test procedure to determine the level of development and school readiness as well as for the early detection of circumscribed developmental disorders and general developmental delays in children aged 4 to 6 years. It assesses non-verbal intelligence, verbal intelligence, receptive and expressive language, visuomotor skills and body coordination, understanding of numbers and quantities, phonological awareness, articulation, attention, and working memory. BUEVA III holds detailed instructions in German spoken language and was standardized on 3875 hearing kindergarten children aged 4-6 years. Hearing status, gender, migration background, or bilingualism were not considered. The external validity of the test is currently not given, as there are only low correlations between the assessments of the parents or educators and the test results of the children in the standardization sample.

The same applies to the SON-R 6-40, which is a non-verbal assessment of general intelligence in children from the age of 6[9] and adolescents and adults up to the age of 40. However, the test primarily measures fluid intelligence as the ability to recognize differences, logical relationships, and reasoning. Renner (2016) emphasizes that due to the limited representativeness of the construct of intelligence, an average result in the SON-R 6-40 should not be interpreted as evidence of generally unremarkable cognitive development without further evidence (p.23).

This means that due to the limited measurement range or because significant intelligence components are not recorded, it is not possible to create an intelligence profile in the sense

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[7] https://www.biss-sprachbildung.de/btools/basisdiagnostik-umschriebener-entwicklungsstoerungen-im-vorschulalter-version-iii-bueva-iii/

[8] https://www.thieme-connect.com/products/ejournals/pdf/10.1055/s-0041-103297.pdf

[9] The child tested here had just turned 6 at the time of the test.

of an overall IQ. Nevertheless, this test is repeatedly used with hearing-impaired children to determine an overall IQ.

Although the SON-R 6-40 explicitly mentions hearing-impaired children, adolescents, and adults as a target group in addition to speech-impaired children, instructions and feedback can be given verbally or non-verbally. The extent to which the test performers give non-verbal instructions to impaired children and how exactly they do this is not monitored. In the present case, for example, an attempt was made to instruct both verbally and non-verbally, but neither was successful.

Regarding the use of the SON-R 6-40, it should also be noted that a study by Toussaint et al. (2012) entitled 'On the validity of the SON-R 6-40 in children with hearing impairment' found that hearing-impaired children achieved significantly poorer results in all subtests and also in the overall IQ compared to the control group. At IQ level, there was an average difference of more than one standard deviation (SD=15) between the hearing-impaired group and the control group.

Physiological causes of hearing impairment, such as genetic defects, infections in the womb, damage during birth, craniocerebral trauma, tumors, toxic substances), which can lead to a reduction in intelligence or neurological abnormalities, were considered as reasons for this. Based on this assumption, the researchers reviewed the questionnaires filled out by the parents in advance regarding physical and cognitive abnormalities. In 4 out of 35 children, the parents stated that their children had a mental disability, and one was autistic. Almost all parents reported difficulties in the areas of attention, concentration, or motor skills. The authors conclude from this survey that the reasons for the poor results in the intelligence test are possibly to be found in the causes of hearing impairment, which can lead to a mental disability. Although they recommend the use of the SON-R 6-40 for the target group of hearing-impaired children, *"the idea of separate standardization should also be discussed for children with severe hearing impairments or deafness"* (p. 119).

The difference between the hearing-impaired children and the control group is significantly more than one standard deviation (SD), and the test was standardized on 1933 hearing children and adults. On average, the impaired children had an 'overall IQ' of 81.57 (SD=16.98) compared to the hearing control group with 98.89 (SD=17.54). Such a result (mean difference = -17.314), if valid, would mean that hearing-impaired children have below-average intelligence compared to hearing children. Hearing impairment per se would then cause a reduction in intelligence. And indeed, in the past, a low IQ of hearing-impaired children has been attributed solely to the child's hearing loss, often based on psychological testing with deficient test systems.

However, Toussaint et al. (2012) *did not differentiate between mild and severe hearing impairments* when *"selecting the children (...)."* (S. 112). The recommendation of the SON-R 6-40 for testing hearing-impaired children with the recommendation to standardize deaf children separately cannot be followed at this point.

The report of the case study described here also draws conclusions that are not permissible. According to the test administrator, it was exceedingly difficult to explain the tasks to the 6-

year-old child because he was unfocused and fidgety. He was unable to follow the verbal instructions, so he needed *"visualization and demonstration"*. Nevertheless, understanding the instructions was difficult, even with non-verbal instructions. The child needed intensive *"motivation and guidance"* for the entire duration of the test.

This means that there could not have been standardized verbal or nonverbal instruction or test administration because various forms of instruction, motivation, and guidance were used during the test administration. This type of procedure massively contradicts the test quality criterion of objectivity. One subtest even had to be aborted because the child was constantly distracted. The person conducting the test reported that the child was merely working on the tasks at random.

Yet the child was ultimately given an overall IQ of 65 based on this testing with the SON-R 6-40. There is an urgent need to reflect on why an overall IQ diagnosis was made in the first place, even though the test administrator herself reported that the test was 'arbitrary' and the SON-R 6-40 does not allow the creation of an intelligence profile in the sense of an overall IQ.

The report often describes the boy as very restless, showing no motivation, unable to concentrate, and usually unable to understand task instructions. It *"slid and rocked around on the chair and wanted to go to daddy."* All of this was perceived as behaviorally and emotionally maladjusted. Whether these assessments are correct cannot be decided at this point. Nevertheless, it must be considered that the child's behavior could have other causes.

Basically, the child was confronted with a continuously overwhelming situation in which he was helpless. Communication or understanding between the person conducting the test and the child was only possible to an extremely limited extent. The child had to follow spoken instructions and work on and solve corresponding tasks that it was unable to process auditorily or semantically due to its poor understanding of spoken language.

Apart from the fact that the test results were not collected correctly and, therefore, cannot be evaluated, the diagnostics conducted do not correspond to the required proportionality. A 6-year-old hearing-impaired child was subjected to psychological test procedures (SON-R 6-40 and BUEVA-III) that he was unable to complete due to his hearing impairment bordering on deafness, which he must have experienced as very frustrating. His behavior during the diagnostic process repeatedly expressed this.

Based on invalid test results, the child was given a diagnosis of 'intellectual disability' with an overall IQ of 65—without considering whether the test was comprehended, or the test tasks could be performed with concentration. As explained above, this is not permissible and suggests that a valid value for intelligence has been determined here.

Diagnoses such as 'learning disability' or 'intellectual disability' cannot be made for deaf children based on psychological test procedures that require hearing and understanding spoken language test instructions. The application of such procedures to deaf children not only is an infringement of their personal rights but also creates a psychological stress situation that can be overwhelming for young children and even traumatizing if they are repeatedly confronted with such a stressful situation at short intervals.

After being diagnosed with "below average intelligence," the child was placed in a "special school for hearing children with mental retardation." The diagnosis of "mental retardation" generates additional help and support services in the existing special education system in Germany, which parents understandably want to provide the best possible support for their child's development. However, the price for this is the diagnosis of "mental retardation," the negative consequences of which are often not recognized by parents and not critically questioned by teachers because more support measures can then be approved. This mechanism in the special education system should be reconsidered, as it could, in case of doubt, encourage the labeling of deaf children as cognitively retarded.

However, this diagnosis is harmful in the long term for deaf children who do not have it because it determines the child's future educational path, which is difficult to correct later. A child with an intellectual disability diagnosis is excluded from certain learning content in special schools, such as learning a foreign language. In addition, regular lessons are often limited to teaching practical skills such as cooking.

As the child was still in the language-sensitive development phase at the time of testing, it would have been necessary to consider and examine a possible language deprivation as the cause of cognitive and social-emotional disorders. If this hypothesis had proved to be true, it would have been important to start immediately with targeted and intensive language support measures in German Sign Language by an L1 signer to compensate for the previously inadequate spoken language stimulation of the child's brain.

In view of the time that has already elapsed in which the child has missed an extensive amount of language input and neural stimulation, a sufficiently intensive and continuous sign language offer through a suitable package of measures appears to be urgently needed. This would at least give the child the chance to find a linguistic connection and build up semantically coherent language competence in an L1.

Unfortunately, as mentioned above, many daycare centers and special needs schools generally employ a majority of hearing professionals who are often unable to sign at an appropriately high level, so the child remains trapped in a language-poor environment. If cognitive stimulation is not provided immediately through rich, high-quality sign language input, the child reported on here runs the risk of developing symptoms of irreversible language deprivation syndrome.

This gap in provision for language-deprived children must be closed as quickly as possible. Until then, it should at least be organized and ensured that the child affected by language deprivation experiences a language-stimulating environment over a longer period, in which he can communicate intensively and permanently in DGS with a number of highly competent deaf peers.

It is obvious that German Sign Language should be the language of choice as an input language because DGS can be processed barrier-free by the deaf child described here, and the symptoms of language deprivation can be treated most promisingly under the given circumstances with a so-called 'sign language bath', i.e. continuous sign language input at L1 level.

4. The need for legal regulation of compulsory sign language learning for prelingual deaf children

Given the devastating consequences of an epidemic of language deprivation, compulsory sign language should be introduced for children born deaf. This would allow the children a natural process of language acquisition and adequate cognitive-emotional development and have a preventive effect against socially induced language deprivation.

Without access to sign language in the first years of life, deaf children can develop disorders on several cognitive levels that prevent them from having equal educational opportunities and leading a self-determined life. They will not be able to develop and realize their full potential. Children need language and communication from the very beginning to discover their interests, develop their talents, and unfold their cognition and personality. Sign language promotes the holistic development of children and young people in cognitive, emotional, social, and physical terms and is the most important form of communication and social integration for the Deaf in their communities.

By stimulating the brain with vitamin L (Gulati, 2017) through sign language, children born deaf can form semantic concepts that are a prerequisite for communicating with sign language peers, family members, and society in general. This promotes their social competence and identity development and enables them to become active members of society. Access to sign language is crucial for acquiring sufficient knowledge, planning, and evaluating one's own actions and activities, improving one's own professional opportunities, and building trusting relationships.

Providing access to sign language should be a widespread practice for deaf children. Parents and siblings should also be given the opportunity to gain experience sign language on a regular basis through home signing courses funded by youth welfare services.

Current practice shows that an application for home signing courses is often associated with months or years of application and legal proceedings on the part of the parents. Although the legal situation is clear, negative decisions are sent out due to individual decisions by inadequately trained caseworkers.

Ultimately, success depends on the commitment of the parents and the resources available to them. This can mean that not only valuable time is lost, during which deaf children remain in a language-deprived situation and develop behavioral and mental disorders as a result, but parents are also deprived of resources that they urgently need for their child.

It is also important to consider what happens to children whose parents have few resources, who struggle to find their way in an extremely bureaucratized system, and who must do a great deal themselves to cope with society's demands. These children are at substantial risk of developing severe language deprivation due to poor environmental factors and weak parental resources.

Learning sign language should be mandatory by law for prelingually deaf children, as this is the only way to ensure that all deaf-born children receive adequate language stimulation for normal brain development from birth.

Making sign language learning compulsory by law will ensure that the fate of deaf children is no longer left to chance and in the hands of hearing staff, but that society takes care and responsibility for protecting them from language deprivation and neuronal socially induced physical injury. This will contribute to the protection of their basic human rights and ensure that they do not suffer cognitive impairment due to social influences.

In addition, the law creates clear and uniform standards for educational institutions, healthcare providers, and other relevant institutions. This eases the implementation of measures to prevent language deprivation and ensures consistent support for deaf children in various areas of life.

An advantage of a legal obligation would be that it would initiate a paradigm shift towards an appreciation that supports the reduction of discrimination and prejudice against sign language. In this way, learning sign language can become a matter of course, indirectly promoting an inclusive society and creating an environment in which deaf people are protected from language deprivation and socially induced cognitive disabilities.

Other long-term positive effects of a legal requirement to learn sign language are strengthening Deaf culture, recognizing a language in a different modality, and creating a basis for protecting the rights and needs of Deaf children.

Due to the urgency of preventing epidemic socially induced intellectual disabilities due to language deprivation in childhood, the legal obligation should be enforced promptly, or existing laws should be amended accordingly to draw the attention of legislators to the issue and create political pressure for change.

A lawsuit to enforce the sign language learning requirement usually requires the assistance of experienced attorneys or advocacy organizations familiar with the specific legal and linguistic cultural aspects and able to adequately represent the interests of the deaf community.

Litigation is time-consuming and lengthy, but it would be part of a more comprehensive prevention and strategy to curb the current language deprivation epidemic among deaf children. Public relations, lobbying, and political mobilization should go with a lawsuit to achieve a short-term change in the current ethically and morally unacceptable situation for deaf children.

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