Chapter 13

Visual Communication Options and Educational Strategies for Children with Hearing Loss

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"The ever-growing issue of public, paediatric hearing loss is a barrier to quality education for deaf and hard of hearing children'

~United Nations Sustainable Development Goal 4, 2015

Introduction

In social and cultural settings amongst children and adults with hearing loss (HL), individuals are defined as either being hard of hearing (HoH), small deaf or big Deaf. Individuals who are HoH usually have sufficient hearing with or without their hearing aid (HA) or cochlear implant (CI) to cope with daily verbal communication. Individuals with HL who define themselves as being deaf embrace technology such as HAs, often use speech to communicate and mingle mostly in the hearing world, though some are also comfortable in the Deaf world. Deaf individuals are those with HL who are totally immersed in the Deaf culture, embrace sign language (SL) as their home language and do not see the need to use HAs or CIs – though some do. In this chapter, the use of HoH/deaf/Deaf will be used only if it is warranted according to the visual modality discussed. Otherwise, the generic term of deaf will be applied to all children with HL.

Irrespective of the language or communication modality chosen, the role that caregivers and family play in the life of a child with an HL is critical. The difference between a caregiver's involvement and their commitment can have a big impact on the child's language development, especially in the critical early formative years. Caregivers who opt for either the Oral/Aural route or the Visual Communication route (SL, Cued Speech, Signed Exact English, Total Communication, etc.) need to be aware that any communication modalities require effort on the caregiver's part to support intact language development in their child if they wish them to keep up with their hearing peers in terms of language, social-emotional and academic milestones. A significant challenge for deaf children born to hearing parents is not only the potential language delay but also the stress experienced as they try to select appropriate communication modes based on how those around them react and respond to their speech only, sign only or sign and speech combined (Lillo-Martin 2016).

A fascinating finding is that both auditory and visual language is processed in the same area of the brain – the auditory cortex – previously thought to be the place of processing sound only. Languages have distinct patterns, whether expressed through the lips or hands, that deaf children must consistently access to develop the internal language skills necessary for reasoning, thinking and communication (Petitto 2000).

Visual Communication options are often only explored when it becomes clear that the child with HL cannot cope effectively in a listening and speaking environment, despite HAs or CIs, making spoken language acquisition challenging and frustrating. For some families it is the only option available to them due to factors like late identification of HL or a family's financial situation. Visual Communication implies that the eyes are used during communication, just as auditory communication suggests that the ears play a major role. There can be a grey area between where both senses are used or needed to communicate effectively – think about a hearing person trying to have a conversation in a noisy environment – it is highly likely that both ears and eyes are being used to help make sense of input. Many may be surprised at how often they unconsciously lip-read while listening, even though they may hear very well.

Each of the different Visual Communication options will be discussed in terms of supporting language development and use in education. All the options have their strengths and weaknesses, which is why some children will do better in one of these languages or modalities as opposed to another, depending on the child's learning style and degree of HL. Essentially, caregivers and therapists need to be encouraged to explore and find the modality that is best suited for the child and the family.

Manualism: South African Sign Language (SASL)

The National Institute on Deafness and other Communication Disorders (NIDCD) defines SL as a complete, natural language that has the same linguistic properties as spoken languages but with grammar that differs from English or other spoken languages. SL is not universal. American Sign Language (ASL) differs in many signs to SASL (South African Sign Language). However, some signs may be universal. SLs are also regional just as some spoken languages have different dialects and different slang words.

The parameters of any language are those features used in its production. For example, spoken English has long and short vowels, hard and soft consonants and diphthongs. SLs are soundless and manual; as such, their five parameters (handshape, palm orientation, placement, movement and non-manual features) define the use of the hands and the body to express the different functions. For example, English speakers raise the pitch of their voice when asking a question. In SASL the question is asked by raising of eyebrows, widening of eyes and slightly tilting forward.

SLs were birthed out of the need to communicate in a world of silence. For centuries, SL was not officially recognised as a language and was stigmatised. Today SLs are recognised around the world. In South Africa, SASL was recently adopted as the 12th official language.

Benefits

There are potentially no communication barriers for a Deaf child since communication is not dependent on hearing, providing that communication partners are also proficient in visual or signed language. The Deaf community has a strong identity in their deafness, their culture and their language, and does not regard deafness as something to be fixed. For the Deaf community, SLs create social networks and relationships between Deaf people across nationalities and cultural communities, binding the Deaf community together in a common language of familiarity, sociability and communality (London 2020). SLs and are also an identity marker for Deaf people from diverse backgrounds. Thus, the ability to use South African Sign Language (SASL) as a mode of communication provides Deaf learners with several important benefits (McIlroy 2008):

- Access to the Deaf community and cultural identity.
- A means of communication both socially and in the classroom.
- Increased confidence and a sense of belonging as valued learners.
- Improved communication with teachers, which enhances learning outcomes.
- Strengthened relationships between hearing teachers and family members.
- Support for a bilingual-bicultural identity, reinforcing both SASL and literacy development.

Deaf children born into families where either one or both parents are Deaf (and fluent in SL) are exposed to the natural SL of the home. For the most part, these children reach similar milestones as their hearing peers and arrive at school with age appropriate language skills.

Not all caregivers who choose to use SASL as a communication modality ever reach an appropriate level of SL skill to meet the ever-growing language needs of their deaf child. Those who do are determined to acquire SL as quickly as possible. Some do so naturally, but for many parents, learning a new second language as an adult is not easy and requires tremendous self-discipline and effort. Those parents who master SL enjoy good communication with their children and are involved with supporting them both academically and socially-emotionally as they learn from each other. Their children, for the most part, reach the same expressive language milestones as their hearing peers, the difference only being the modality. They are able to think, reason and enjoy the same benefits that language has for intellectual and cognitive development.

Challenges

Parent guidance support is needed to encourage first language development and teach strategies to caregivers to ensure all Deaf children arrive at school with a language age on par with their hearing peers. Not only is learning another language at a later age a challenge for parents, but they also need to be supported in how best to accelerate learning and use SL effectively with their baby or young child. Despite the ease of communication that can stem from using SL, the complexity of Deaf Education is highlighted by Deaf learners who come from diverse visual, signing, literacy or even oral backgrounds (Garcia and Cole 2014). McIlroy (2008) emphasises that there is no singular, universal deaf narrative, but rather a multiplicity of personal journeys that affirm the diversity and complexity of the struggles that different deaf individuals experience. It also highlights the possibilities available to Deaf learners to overcome difficulties regarding language and literacy learning (Böhringer 2021).

The limitation of caregiver proficiency in SL means their child may not receive the appropriate level of communication and increased language input in the home environment (Pontecorvo 2024). In addition, family members and friends need to learn SL too, sincethe emotional well-being and social network of the deaf child depend on their willingness to do so. However, acquiring SL may prove to be a challenge for them. The issue is compounded further in that most schools for the Deaf are residential, meaning that new learners' SL skills develop rapidly and effortlessly through being immersed in a hostel with Deaf hostel parents, Deaf peers and those older Deaf learners who are already fluent and able to model conversational signs. Furthermore, many learners do not go home every weekend; thus, the signs they learn at school do not necessarily carry over into the home. It is for this very reason that learners who are unable to communicate effectively at home say they feel more at home at school because they cannot communicate with family members and are isolated during the holidays. This can cause tremendous emotional stress on the caregivers, siblings and the deaf child.

Academic support

In South Africa, most of the Schools for the Deaf fall under the purview of the Department of Education and follow the national Curriculum Assessment Policy Statement (CAPS) curriculum. The Home Language SL document, for the most part, mirrors that of spoken home language documents with some semantic changes to accommodate the difference between a Signed and Spoken language (for example, 'Listening and Speaking' becomes 'Viewing and Signing'). Provided that the Deaf learner has access to early intervention prior to coming to school, it is assumed that they will progress at the same rate and level of hearing peers. However, due to the severe language delay that many Deaf learners present on arrival to school, the necessary academic and language support required to make allowance for the gaps in language development are not necessarily covered in the CAPS curriculum. While the content of subjects and concepts can be readily accessed through signing, the need to address low world-wide literacy levels amongst the Deaf remains the most urgent challenge.

Most schools for the Deaf teach SASL as a Home Language and English as a First Additional Language through writing. This presents its own set of challenges as learners have to express themselves in a language they struggle to access, internalise and express in a written format. It furthermore causes barriers to academic development as it depends heavily on the skills and ability to master reading and writing. However, with concessions like SASL interpreting or

adapted question papers and extra time allocation, some learners go on to achieve amazing results.

Auditory–Visual Approach: Cued Speech/Cued Language (CS/CL)

Cued Speech is a visual system of communication that uses eight handshapes in four locations near the mouth, in combination with the information visible on the lips, to make a spoken language clear through vision alone (https://cuedspeech.org/). It supports visual and auditory access to a spoken language. Used in any setting, Cued Speech/Cued Language (CS/CL) is a lesser-known visual communication tool that supports a spoken language. It was designed to aid lip-reading by removing the confusion of similar-looking speech sound patterns or phonemes on the lips, resulting in accurate visual receptive access by the deaf child to the intact, complete and meaningful units of a spoken language in all its forms, without needing speech or hearing (LaSasso 2010).

Benefits

Using CS/CL provides visual access to the spoken language for children with a severe to profound HL who struggle to access speech sounds despite HAs or CIs. It takes two weeks to six months to master the cue-sound associations for the forty-four sounds used in the English language. Caregivers are not learning a new language – it is merely a tool for making the language they already know easily accessible to the deaf child. A child consistently exposed to a cued language visually internalises the language in its intact form in the same manner a hearing child does through audition, and benefits from being able to better lip read than those who do not cue (or sign).

Challenges

As with all communication options, the benefits of CS/CL are dependent on those willing to master it and use it optimally for the benefit of the deaf child. It is not widely known and many in the Deaf community feel threatened by it, fearing that SL will be replaced by CS/CL. CS/CL was designed to support visual receptive access to a spoken language like English. As with all communication options, not all deaf children may benefit, especially older learners set in

their ways and those with barriers to learning. It can take up to three years for full benefits to be seen. As with all languages, the earlier the exposure the better.

Academic support

Using CS/CL with a deaf child is versatile in that it can be used in any setting – be it in the home, in a classroom with hearing children, in a classroom with deaf learners as manual bilingualism or in therapy sessions. Being able to communicate both at home and at school has positive emotional-social implications. The use of the word 'speech' in CS does not imply that the deaf child has to speak. If the child wishes to learn to speak, they will still need speech therapy since the cues do not show how to produce the speech sound, but simply which sound is being said in a motoric sequence of sounds that make up a word. However, the speech therapist can cue the target sound clearly and teach the child how to make the targeted sound, leading to natural speech sound – known as sound-cue association. Some deaf children do, in fact, start talking voluntarily when they have the confidence of knowing what sound to make and when to say it in a word, as there is clear reception and no guessing.

The cues prime the brain on what to listen for and takes away the guesswork and confusion of lip reading alone. We constantly encode what we write (from speech sounds to letter-sound association) and decode what we read (from letters to speech sounds) and thus the words and phrases are said aloud. It is a skill desperately needed by young deaf learners to support them on the ladder to literacy to aid phonological awareness, syllabification, fluency, vocabulary and comprehension (Kyllo 2010).

Bilingualism: Bi-Bi (Bilingual-Bicultural)

The Bilingual–Bicultural (Bi-Bi) approach incorporates the use of SASL as the Language of Learning and Teaching (LoLT) in the classroom (Böhringer 2021). English or another spoken language is taught through reading and writing print. The deaf culture, its history, values and customs are also taught. Strong emphasis is placed on developing a healthy sense of self through social contact with other Deaf individuals.

Research on bilingualism has birthed different approaches and new terminology. Bimodal Bilingualism is bilingualism involving two modalities, such as SL and a spoken language. This

generally refers to a CODA (a Child of Deaf Adult/s) raised in a family with one or more deaf parents but is hearing, not deaf. A CODA can code-switch and/or code-blend. It can also refer to a Deaf child who is fluent in both signing and in a spoken language like English through writing or speaking. Emergent Bilingualism is when learners continue to develop their home language while also learning a second language. Simultaneous Bilingualism applies to very young children who are exposed to two or more languages at the same time and become fluent in both. More recently, the phrase Translanguaging has come to the fore. This is a process by which multilingual speakers use their various languages at different times to convey meaning in a conversation, and use the most appropriate word in any of their known languages to communicate.

Benefits

Relevant for Deaf Education is the Bi-Bi approach, which stresses learning two languages – SASL and English/Afrikaans, and two cultures – the Deaf and the hearing world. A bilingual learner has a better opportunity of integrating into the mostly hearing world. Being able to communicate in both SL and in the spoken language – either through speech or writing – is a benefit and essential to be employable. Being able to communicate in the language of the home will also go a long way in breaking communication barriers and providing the emotional-social support a deaf child desperately needs.

Challenges

The SASL CAPS document encourages educators of the Deaf to fulfil the mandate that 'SASL and English is to exist independently but to be parallel in status' (Department of Basic Education, 2014). Currently, the two languages do not exist independently, since SASL is used to support teaching in English. The patterns embedded in English are not accessed easily as they are overshadowed by the structure of SASL. Teacher skills in SASL (a different language to Signed English) and teacher understanding of the cultural identity of the Deaf community impact the success of the programme. The when and how of introducing English is still a controversial topic. Teaching English through reading and writing is not conducive to natural language acquisition.

Hearing children come to school with an intact language that they use for the task of learning to read and write. This is not usually the case for the severely delayed language Deaf learner (Kyllo 2010). These children do not benefit from the usual crossover that a Home Language learning of phonics and phonological awareness offers to a second spoken language, as SASL is a soundless, spatial language. Sadly, most Deaf learners do not achieve age-appropriate literacy skills as they struggle to master a language they cannot hear and understand, but are required to read and write without first being able to internalise the language through natural face-to-face interaction during pre-school years.

Total Communication (TC)

TC is an approach (or philosophy) to communicating that aims to make use of all means of communication, such as using hearing technologies to encourage access to a spoken language, including the use of listening, speechreading, speech, natural gestures, body language, fingerspelling, signing, written and visual aids, and in some programmes, CS/CL, depending on the particular needs and abilities of the person. The selection of specific communication modalities is to support the unique needs of the child and their family. A child may require more of an auditory/oral approach to listening and speaking, while another may benefit more from watching and signing. The teacher could also vary input that is at times only oral and at times only sign-supported.

Benefits

TC rests on the premise that every deaf/Deaf child's communication needs and receptive access to a spoken language are different and may require different tools to develop language and literacy competence. TC is also used to address communication difficulties associated with a range of additional conditions like neurological problems, autism, learning difficulties and physical disabilities. Today, hearing technologies are much more advanced so that more deaf children are able to access a spoken language effectively and are less dependent on sign systems. An increasing number are even able to cope in mainstream schools.

For natural language acquisition using any of the modalities discussed thus far, the language used needs to be accessible, and the parents and other members of the deaf child's social circle should be able to use the language effectively in face-to-face communication. Only then will there be the relevant volume of interaction needed for language, cognitive, and

emotional development to occur (Mayer and Trezek 2023). Caregivers need to have a clear understanding of the difference between a language and a modality, that is, to choose the language they want to communicate in before choosing the modality that supports access to that language. It is important to help caregivers understand that access to a spoken language can be supported visually.

Challenges

Hearing technologies still limit access to effective auditory input for profoundly deaf learners and most TC programmes lean more to the visual-manual component (Mayer and Trezek 2023). The success of these programmes also depends heavily on the teaching skills of the teachers in the classroom – some make more use of simultaneous English-based signing, and some use more of the oral component, both of which may omit access to the critical grammatical structures of English because of less-than-optimal hearing. Unless it is clearly stipulated that English is the desired language and signing is used as a modality – namely, signing some key words or signing everything – the integrity of both languages can be corrupted. Neither is it then made accessible in its intact form.

SASL has its own grammatical structure that is very different to English. Additionally, there are concerns for exposing learners to a form of simultaneous English-based signed communication that may not match their level of reading or language readiness, especially in the early formative years. It is important to determine whether the programme offered matches the needs of the deaf child.

Educational strategies

Historically, educationally significant HL ranged from a moderate to profound degree, but more recent research shows the vast impact of minimal and mild HL as well as unilateral HL on academic performance (Winiger, Alexander and Diefendorf 2016). Please note: In this section, the term ‘caregiver’ or ‘family’ is used as many children are raised by carers who may not be their biological parents, due to cultural, financial, health or employment choices.

To address the diverse communication needs of children with HL, several education/schooling options should be available, including inclusion in mainstream, facilitation in mainstream or special educational needs. In an ideal world, these schools would provide an academic

curriculum using SL, spoken language and TC. However, realistically these options are not widely available, and if they are available, they are often not accessible to those who need them. In struggling education systems, particularly in low-middle income countries (LMICs), the availability of various educational options may not be a reality. This often results in special needs boarding schools for deaf learners, which are scattered across the larger cities in these countries. Listening and spoken language (LSL) schools, traditionally known as oral/aural schools, are often dependent on the availability of technology, while schools for the Deaf, primarily using SL, may struggle to find educators proficient in SL. In either situation, family commitment to language learning and education is pivotal for the child's success. These pitfalls can result in limited access and poorer education levels for children with HL.

Inclusive education

Inclusive education is the integration of learners with disabilities into general, mainstream education, with suitable support and assistance, to meet their different abilities, learning styles and backgrounds (Li and Potmesil 2022). Mainstreaming usually refers to the physical placement of a child with special needs in regular classrooms with typically developing children. Inclusion is a broader term referring to a more complex process that involves adaptation to each child's needs within the regular classroom (Armstrong, Armstrong and Spandagou2011).

Special needs

A school for learners with special needs caters for children with learning, physical and behavioural difficulties. Generally grouped with children of similar needs, this education system should be adapted to suit the unique learning styles required while customising the curriculum. Special needs schools are known to foster a sense of belonging. It can be beneficial to place a child with HL who is learning to listen and speak in a special needs LSL school for their foundation years and, if appropriate, transition them to a mainstream school for primary/middle and/or high school education. However, this is dependent on careful consideration and support from the family, healthcare and education teams.

Individualised Education Programme

An Individualised Education Programme (IEP) serves as the foundation for providing a high-quality education to every child with a disability. Regardless of whether a child with HL is educated in a mainstream or special needs education system, an IEP is essential to keep the team accountable and working towards appropriate, current, shared goals for the benefit of the child's development. The IEP should be reviewed at least every six months for reflection on successes and challenges and for planning ahead. This meeting should be open to all team members and must always include caregivers.

Factors Affecting Choice of Education

Age of diagnosis

The age of diagnosis has a significant impact on the deaf or HoH child's education options – most notably for the congenitally deaf child. Newborn hearing screening (NBHS) is the first step to early hearing detection and intervention (EHDI) which is 'a vital predictor of future language and educational outcomes' (Moeller and Tomblin 2015) (Chapter 4). Before age three years, the brain will expertly form neural pathways to establish a communication system, be it visual or auditory. However, should the brain be exposed to visual stimuli only (because an infant is born or acquires HL early in life) it is difficult to alter the mode to auditory communication after age three (Kral and Sharma 2012). Children with early-onset HL living in countries where NBHS is not implemented have a later age of diagnosis. This, in turn, affects their audiological management opportunities and, of course, success in spoken language programmes. Some CI programmes have limits for the age at which they will implant a child with congenital or early-onset HL (anything between two and five years of age) due to resource constraints and proven poorer outcomes with later implantation. These strict candidacy criteria are particularly prevalent in LMICs (WHO 2018). Along with technology, (re)habilitation is key for deaf or hard-of-hearing children whose families have chosen spoken language as their communication mode.

Home language

Home language may differ from the language of education for learners with HL who attend special needs schools. The limited number of special needs schools for deaf children means

that the language of choice is generally the most established language in that country. For families who speak a minority language, this may mean educating their child in a second or even third language or perhaps a language unknown to the caregivers. This language barrier has implications for communication between educators and caregivers, while also posing a difficulty for caregivers in assisting learners with homework and carryover. In these cases, schools may need to offer homework opportunities after contact time at school, provide correspondence to caregivers in alternative languages and have interpreters available for meetings between families and educators.

Caregiver support

Due to the frequency and length of a child's school career, it is essential that caregivers and teams have realistic, achievable plans in place for the child. These plans are primarily the caregiver's responsibility and may include reliable, safe transport arrangements, after-school care, adult supervision for homework, and availability to meet teachers and team members. Caregivers may need to join therapeutic sessions for effective carry-over at home and engage in additional homework in speech-language therapy or occupational therapy. They may also need to consider longer, more expensive transport options if the school is far away from home (in the case of attending special needs education). These additional requirements necessitate financial supplementation— it is expensive to educate a child with HL on top of maintaining the expensive hearing technology. In education systems where special needs support is lacking, caregiver involvement is key to the academic success of the child. Incidental learning, through overhearing, accounts for up to 90% of what children learn (Madell 2016). However, for children who are deaf or hard-of-hearing, incidental learning is not guaranteed, even with appropriate hearing technology.

Ecosystem around the Child with HL

Team

From the time of the HL diagnosis, a team should develop around the child. Caregivers are central to this team and must be empowered to manage their child's hearing and educational access, so that the child's abilities are promoted and their needs met at each stage of their academic career. This therapeutic/healthcare-based team usually includes some, if not all, of the following professionals: An audiologist, speech-language therapist, early

interventionist/teacher of the deaf, paediatrician and ENT specialist (Chapter 14).

Some children may require additional assessment and management by an occupational therapist, physiotherapist, paediatric neurologist, ophthalmologist or geneticist. The advisory team should not be so big that responsibility is diluted and management not carried out, but also sufficiently informed that all aspects of the child's development are considered. The child's team will change over time due to their developing needs. Due to the wide range of academic, linguistic and social-emotional needs of a school-age child with HL, no one discipline can provide all the required input (Gustafson, Newsome, Pilling and Segura 2024). The term 'educational audiologist', which is not widely used, refers to an audiologist based in the education sector who ensures a child with HL has optimal and consistent auditory access in class through acoustic accommodations and remote microphone technology. Hearing Resource teachers, Itinerant Teachers, Teachers of the Deaf or Peripatetic Teachers refer to teachers with additional training who are involved in the education of children with HL (Estabrooks, MacIver-Lux and Rhoades 2016).

Acoustic accessibility

To maximise the learning potential for a child with early onset HL who is learning to listen and speak in a special-needs or mainstream education environment, optimal acoustic accessibility must be provided. This can only be made possible through hearing technology for children who are deaf or hard-of-hearing. The reciprocity in the teacher-child relationship is vital for the success of children with HL in the mainstream environment. Children and their families will affect teacher expectations and the teacher's beliefs and knowledge will affect the child's success of inclusion. Special needs classrooms for deaf and HoH children require established daily routines, time-based schedules and low child-to-staff ratios. In either education system, the child's level of communication should be acknowledged, understood and accommodated by everyone working with the child.

Children with either unilateral or mild HL can experience similar educational barriers to those with bilateral HL. Unilateral or one-sided HL affects the ability to localise sound in in the presence of background noise. This lack of localisation has a negative impact in the classroom, which is a naturally occurring noisy environment, and on the sports field where direction of sound is important (Winiger, Alexander and Diefendorf 2016). Learners with mild HL face comparable risks of poor psychoeducational outcomes to those with moderate and severe permanent HL (Shafer, Kirby and Miller 2020).

The acquisition of routine and play-based skills promotes academic success as children move through the stages of schooling. Language and social skills spill over into academic skills. For example, early childhood maths skills are used in solving simple story problems in a real-world context, and in understanding specific times for particular routines. Therefore, these skills need to be taught to the child with HL who may have missed the language cue.

Listening fatigue

Listening fatigue is caused by the increased effort in cognition required to process and understand speech. Contributing factors to listening fatigue are the degree of a child's HL as well as background noise. For a child with HL to understand and process speech in the noisy classroom setting, there will be a greater demand on cognitive resources. Over the duration of an academic day, this increased mental effort can have a cumulative effect. According to McCreery (2015), 'These challenges can place children with HL at a greater risk of academic difficulties and even long-term health problems'.

Remote microphone technology

Distance, noise and reverberation negatively impact everyday listening situations. The ideal distance for good speech understanding is approximately 1.5 metres from the hearing technology microphone to the speaker's mouth (Wagener, Vormann, Latzel and Mülder 2018). Maintaining this distance is not feasible for children on the move and certainly not realistic in an education setting. To ease complex listening situations for deaf children using hearing technology, a remote microphone (RM) is an essential accessory that improves speech understanding and educational performance in the classroom. The signal-to-noise ratio (SNR) is used to measure the level of a speaker's voice in relation to the background noise. With technology improvements, RM is available for many listening requirements. Even children with typical hearing but additional listening needs (for example, auditory processing [Chapter 8] and attention deficit disorders) can benefit from RM technology.

Classroom environment

The classroom is a noisy environment for all children, and it creates significant listening challenges. An immature auditory system struggles to process spoken language from teachers and peers. Classroom noise is caused by learners' movements and speech, environmental

sounds outside the classroom (traffic, construction or gardening machinery) and operational equipment (air-conditioners, projectors, fans, computers). High levels of background noise will mask the teacher's voice and degrade the speech components. It is well known that 'children with HL perform more poorly in noise than children with typical hearing' (Estabrooks MacIver-Lux and Rhoades 2016). Increasing the SNR is the ultimate goal, but reducing background noise sources is the most cost effective and practical. Table 13.1 presents environmental modifications and instructional strategies that can be helpful in the classroom.

Table 13.1: Classroom modifications and instructional strategies

Classroom modifications	Instructional strategies
Turn off equipment that is not in use to reduce low-frequency background humming, for example, projectors and fans.	Rephrase questions or answers from both teachers and peers for clarity.
Close windows, schedule maintenance outside contact hours and move children with hearing technology away from sound sources.	Ask open-ended questions to clarify whether the learner heard correctly, for example, "What did you hear?"
Reduce reverberation—the persistent sound energy that continues after the initial sound source has stopped—by using sound-absorbent materials.	Provide new vocabulary before the lesson, for example, before learning about different angles, provide the child with words like 'obtuse', 'acute', 'reflex' and frequently repeat new vocabulary items.
Install curtains, carpeting and tennis balls or soft pads on chair and desk legs.	Use a natural vocal loudness to reduce distortion caused by overly loud speech.

Classroom modifications	Instructional strategies
Add acoustic panelling, sound tiles, corkboards or even egg boxes to ceilings, walls and shelves.	Reiterate information presented in videos or clips using visual or auditory formats, or ideally both.
Plan strategic seating arrangements for children with HL. Place them away from noise and as close as possible to the person who speaks most frequently—generally the teacher.	Give visual examples of new sounds, words or concepts, for example, a written word with a picture or symbol.
Begin each day with a listening check, as this is essential for children using hearing technology. Ear-specific assessment of each device ensures that the child can detect and/or identify speech sounds across the frequency spectrum, for example, the Ling–Madell–Hewitt 10-sound test.	Gain the child's attention, make eye contact and avoid speaking from a distance or with your back to the learner.

Distance is a critical factor for children using hearing technology. The distance that sound energy needs to travel from a speaker's mouth to a listener's ear influences the loudness of that message. Thus, the greater the distance, the less intense the sound, the poorer the speech perception. This can be difficult to control and consistently monitor, but in the absence of RM technology it becomes one of the single most important acoustic modifications that can be made in the classroom. Putting the child as close to the teacher (or speaker) as possible will limit speech energy loss and promote speech understanding (Estabrooks, MacIver-Lux and Rhoades 2016).

Instructional strategies

Acoustic and classroom modifications cannot entirely solve the difficulty of speech understanding in the classroom. Strategies implemented by teachers, assistants, coaches, friends, parents and the child themselves can greatly improve the ease of listening for a child with HL and/or hearing technology. It is the responsibility of the child's team to ensure all those working with the child understand their hearing levels with and without technology, their receptive and expressive speech and language ability as well as additional difficulties.

Preparatory strategies are essential in inclusionary style learning for peers to understand the needs of the deaf or HoH child. Peers should be encouraged to support deaf or HoH learners by speaking one at a time, raising their hands or saying their own names for the deaf learner to localise the sound source, avoiding interrupting, using visual support to explain new topics, making lips and faces visible when speaking and being prepared to repeat themselves when required. These strategies can be facilitated through awareness and training from class inception, for example, through a demonstration of the senses and how they work, discussions about disability and how we all differ, reading books and stories about children with HL and even simulating degrees of HL to foster understanding and compassion.

Self-advocacy

Self-advocacy is an essential skill for children with HL. There will be times in their lives when those around them are unaware or apathetic of their needs. For the child to hold a strong self-concept and belief, they need to observe advocacy from their community from a young age. Like with all learned human behaviour, the way in which their caregivers respond to questions or reactions about their HL will determine their own response to it. All children must possess basic self-worth before feeling sufficiently secure to respond to questions or actions regarding their HL and/or technology.

It is imperative that children participate in social and academic opportunities at school — that is in fact inclusion. A child's success in social situations will be largely determined by their language skills as well as soft skills, which rely on the effective development of executive function and non-verbal social communication. These social skills required for interpersonal relationships often need to be taught in children with HL as they are not intrinsic.

It is essential that a child who is deaf or HoH takes increasing responsibility for their technology and RM in education settings at an age-appropriate stage. Depending on the developmental ability and technology history of the child this can be as early as four years of age but is probably more typical around the formal education age of five-to-six years. Self-learning is best facilitated through problem solving and role play which is the responsibility of the caregivers, educators and therapeutic team. Improvising situations and then using those practiced skills in real-life supported situations will lead to effective self-advocacy in the future.

Conclusion

Following the diagnosis of HL in children, families must make critical decisions regarding mode of communication as this influences educational placement. These decisions have significant implications for auditory, linguistic, cognitive and psychosocial development, and should be guided by a multidisciplinary team through evidence-based, family-centred and individualised intervention planning.

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