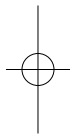
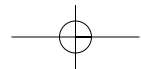


EduLink™

The Link to Learn



**The Link for Children  
with Unilateral Hearing Loss**  
A Guide for Parents and Teachers





“When our daughter was diagnosed with Unilateral Hearing Loss, we felt sad and relieved. Things made sense now. It hadn’t been about being disruptive, non-compliant or mischievous – she just hadn’t heard or understood...”

Daniel Maitland, parent of Kim

## Introduction

If you are reading this brochure, you probably know someone with Unilateral Hearing Loss. This person may be your child or your grandchild, your (little) brother or sister, a child or student in your classroom or one of your friends.

Maybe that person has only recently been diagnosed with Unilateral Hearing Loss and you feel confused and have many questions to ask. It is important to know that you are not alone. Many others have had feelings and anxieties. And they have looked for answers to their questions.

It may be that you have known about the Unilateral Hearing Loss for some time already and, for some reason, now is the right time to find out more about what possible technological solutions are available to reduce some of the difficulties.

This brochure addresses Unilateral Hearing Loss, the difficulties it may cause and EduLink, an FM receiver specifically designed for children who have some degree of normal hearing, but difficulties understanding in the classroom. Also included is a board game which you can play as a family, in class, in groups or among friends to address the topic of hearing loss and some of its issues.



## Hearing loss: an invisible filter

Any type and degree of hearing loss presents a barrier to a child's ability to receive information and learn from his or her environment. As a consequence, if children are able to hear and understand well, they will be able to communicate and acquire knowledge. However, if a hearing loss filters out valuable and accurate information, the child will not have optimum access to language. This will influence his or her ability to develop speech and language skills, the foundation for later reading and academic skills.

Children, by their very nature, are more at risk than adults in noisy environments, because they bring a different listening ability to a situation. On the one hand, they do not have a complete neurological system, meaning their auditory nervous system continues to mature and specialize until their mid-teens. As a result of this, children do not have the same skills as adults to process speech and background noise

at the same time, which explains why also in real life, children have more difficulties understanding speech in noisy environments (on the street, at parties, in the classroom etc.). On the other hand, they also lack the years of language and life experience that enable adults to fill in the gaps when part of a message cannot be heard – e.g. when surrounding noise smears the speech signal, when a hearing loss filters part of the message out or when speech gets too soft over a greater distance.

But what is a hearing loss? And how do hearing care professionals define it? What are short- and long-term disadvantages that come with it?

Professionals usually define a hearing loss in words and in numbers.

“Knowing the degree and type of a hearing loss is crucial. Equally important, however, is finding out more about the child’s functional hearing skills.”  
Erika Lowrie, audiologist

## Hearing Loss in Words...

... to describe the degree and type of hearing loss

The **degree** of a hearing loss is classified as mild, moderate, severe or profound.

There are 3 different **types** of hearing loss, depending on the location of the damage (site of lesion) in the auditory system:

- A **conductive** hearing loss results from an abnormality in the outer or middle ear. This type of hearing loss causes a decrease in loudness perception or a loss of loudness. Sounds are no longer loud enough to be heard well. This can be a permanent or temporary condition.
- A **sensorineural** hearing loss originates in the inner ear. It leads to a decrease in loudness as well as in clarity perception. Generally, there is no medical or surgical means to correct a sensorineural hearing loss. However, today’s hearing technology can provide valuable support.
- A **mixed** hearing loss is a hearing loss that has both a conductive and a sensorineural component.

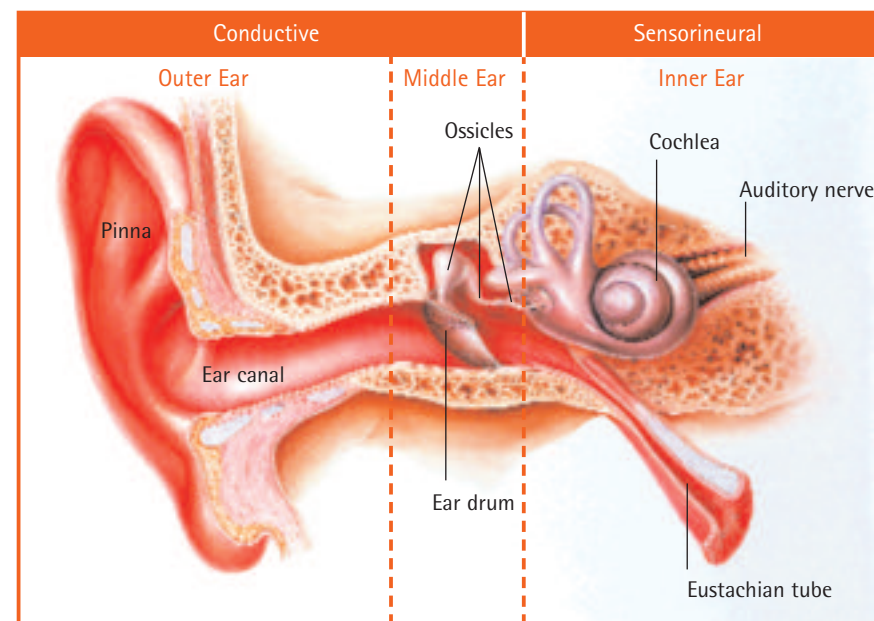


Figure 1 shows the three parts of the ear



## Hearing Loss in Numbers...

... to specify the amount of hearing loss

Hearing loss is measured in decibels (dB). A hearing test, called puretone audiometry, records the level of hearing (measured in dB) at different frequencies (e.g. low and high pitch sounds). Normally, each ear is tested separately. For each frequency, the audiologist will note the lowest audible dB level (corresponding to the softest stimulus for that specific frequency) on an audiogram. Connecting these responses forms the (left and right ear) hearing thresholds. The average dB level for each ear will give the degree of hearing loss for that ear.

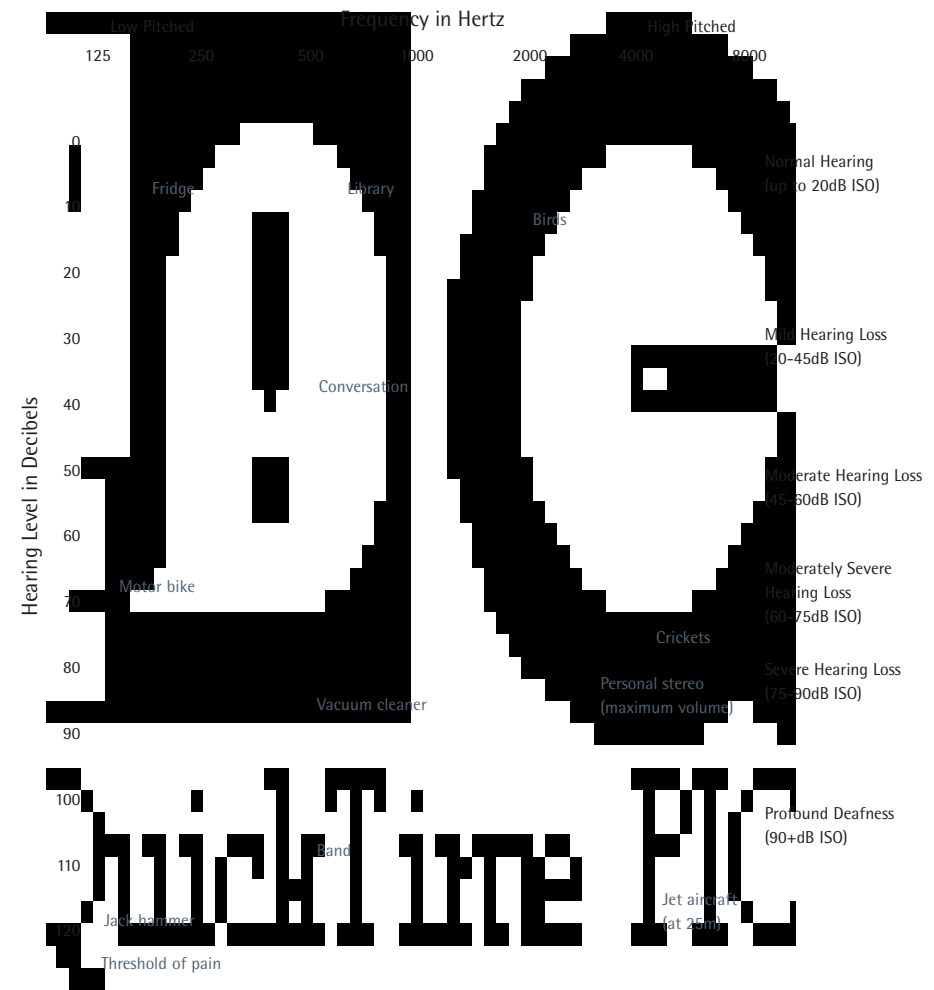
If a person has a hearing loss in both ears,

we call this a "bilateral hearing loss".

If a person has a hearing loss in one ear only,

we call this a "Unilateral Hearing Loss".

Figure 2. shows an example of an audiogram. By copying your child's test results on this audiogram, you can easily find out the degree of hearing (loss) of your child for each ear and which sounds he or she may be having difficulties with.



\*Reproduced with permission from Australian Hearing



“Because of the Unilateral Hearing Loss, he often seemed “disconnected”. We needed to address some things more systematically, which our other children had learned almost automatically.”

Sandra Lennox, parent of Barry

## The Child with Unilateral Hearing Loss

A child is diagnosed with “Unilateral Hearing Loss” (UHL) when he or she has normal hearing in one ear – with average hearing thresholds ranging between -10 and +15 dB HL – and at least a mild permanent hearing loss in the other ear. The degree of hearing loss in the affected ear can range from mild to profound.

The word “unilateral” stems from Latin. It combines “unus”, which means “one”, with “latus”, which means “side”.

Some professionals, inaccurately, refer to a Unilateral Hearing Loss as a “one-sided deafness”. The term “deafness” should only be used when the hearing loss is in the profound range. When a person’s hearing loss is in the mild to severe range, we use the term “hard of hearing”.

We know from stereo recordings that by using two microphones, we can create a more natural and lively sound. Hearing also functions “stereo”-wise. The hearing centers of the brain rely on two independent “microphones” – the ears – for optimal sound

processing. If only one ear is functioning properly, sounds will sound softer and one will have difficulty understanding speech in noisy environments and localizing sound. This is because we need and use:

- Two ears to distinguish speech from noise
- Two ears to locate the origin of a sound
- Two ears to hear at the appropriate loudness
- Two ears to hear naturally and clearly

Without the proper functioning of two ears, a child with Unilateral Hearing Loss (UHL) can be at risk for academic, speech-language, social and emotional problems, often requiring additional support to address his or her needs.

And remember, your child is not alone... Around 8 million children in the world have a Unilateral Hearing Loss.



In general, a child with Unilateral Hearing Loss will have difficulties:

- Hearing soft or distant speech
- Hearing where a sound comes from
- Finding the person speaking right away
- Keeping track of who is talking when two or more people are talking to each other
- Hearing specific sounds

The effect is greater for children with a UHL in the right ear than for children with the loss in the left ear. The right ear is predominantly connected to the left part of the brain, where most of the speech and language functions are located.

The child with UHL will also have difficulties understanding when spoken to on the affected side.



## Classroom Learning at Risk

Classrooms are known to be noisy environments. The noise often "smears" the teacher's voice, which – although still audible – will no longer be intelligible.

In mainstream classrooms, hearing and listening are the cornerstones of learning. If a child cannot hear the teacher clearly, this will automatically influence the child's learning and academic success.

Children with Unilateral Hearing Loss are at risk for academic difficulties. **According to some studies, at least 35% of all children with Unilateral Hearing Loss fail one grade or more.** The invisible filter of the Unilateral Hearing Loss distorts, smears or eliminates incoming sounds. This can interfere with the development of a child's spoken language, reading and writing skills and – finally – academic skills.

As all children spend much of their day engaged in listening activities, they need clear and consistent access to spoken instruction. This will provide the best opportunities for learning over distance and in background noise.

Studies have shown an FM system is the only audiological recommendation that produces the highest speech understanding scores in both quiet and noise.

Children with Unilateral Hearing Loss benefit greatly from an FM system in environments where noise may interfere with learning. Such as in school, at home, on outings, in the car or even at the zoo.

In ideal situations, background noise should not exceed levels of 35 dB. However, in most typical classrooms, levels as high as 65 dB or more have been measured. Noise sources may be other pupils talking, a fan or air conditioner, paper rustling, chairs moving, hallway, street or playground noises.



“Since she is using her FM system, Ellen has caught up dramatically. And even in our smaller sessions, I have found great use for the system.”  
 Frances Hawthorn, remedial teacher

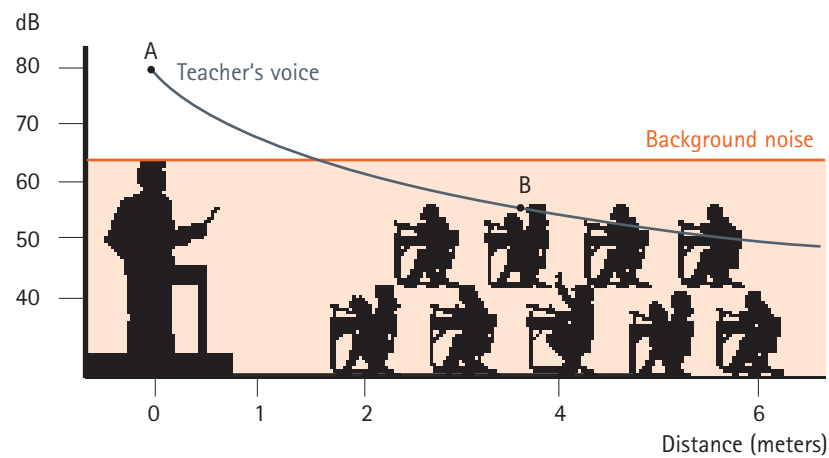


Figure 3. The teacher's voice gets softer with increasing distance. Background noise is equally loud over the classroom and can reach levels up to 65 dB and higher.

As figure 3 shows, only at the very front of the classroom will the teacher's voice be strong enough to rise above the background noise, and only there a clear audible and intelligible signal can be guaranteed. For most children, however, the speech signal is softer than the background noise.

The signal-to-noise ratio (SNR) refers to the difference between the level in dB of the signal and the level in dB of the noise. At point A, the teacher's voice has a signal level of 80 dB and background noise reaches a level of 65 dB. This results in a SNR of +15 dB where speech is clearly distinguishable from noise. At point B, less than 4 m from the teacher, the teacher's voice has a 55 dB loudness level while background noise is still at 65 dB. The SNR at this point is -10 dB with noise obstructing the intelligibility of speech.



“With the FM system, I can hear the teacher’s voice clearly and learning has become so much easier. Especially in areas where I am having difficulties – in science and during spelling tests.”  
Karen Jarvis, student

## The Direct Link between Teacher and Student

In the past, audiologists and ear-nose-and-throat physicians were hardly concerned over a child’s Unilateral Hearing Loss and usually told parents “not to worry”.

Today, children with Unilateral Hearing Loss are monitored closely. They are seen regularly for audiological evaluation to monitor both the good ear and also the worse ear. When necessary, they are enrolled in comprehensive management programs including:

- 1 Direct remediation of specific skills the child has difficulties with (e.g. with regard to speech-language, audition)
- 2 Training of compensatory strategies, teaching the child to look for cues or alternatives to better understand (making use of context, rephrasing, using visual cues)
- 3 Environmental modifications such as acoustic classroom modifications and the use of wireless communication technology such as a personal FM system.

Children with Unilateral Hearing Loss typically need a signal-to-noise ratio (SNR) of +15 dB to +20 dB in the classroom. Evidence shows that preferential seating or speaking with a loud voice to increase the acoustic advantage are ineffective and cannot guarantee satisfactory SNR values. Only FM systems remain the effective way of increasing speech understanding in background noise and over distance.

FM is a wireless communication technology used in a variety of applications (cordless telephones, two-way radios, baby alarms, wireless headsets, etc). An FM system consists of a transmitter, which picks up the teacher’s voice at the mouth and sends it via radio waves and an FM receiver, which delivers the signal to the ear.



It has been proven that children with Unilateral Hearing Loss perform significantly better with an FM system, and their word recognition improves significantly in both quiet and noisy situations.

In the past, personal FM systems were bulky and far from practical. Parents, teachers and children reported how body-worn systems were stigmatizing the children wearing the device and how occluding earphones made participation in class extremely difficult. Additionally, we know from professional experience that, for many children with hearing loss, sound-field systems do not deliver the best SNR and therefore don't always improve performance in the classroom.

Evidence shows that, with the right kind of FM solution, clear benefits in noise, reverberation and over distance can be achieved.

- Increased attention
- Optimal spoken language understanding
- Higher academic achievement
- More consistent on-task behavior
- Maximum speech understanding in noise
- Improvement in classroom behavior

EduLink by Phonak was developed specifically to address these issues. Its design and functionality are based on the results of clinical and scientific studies. It provides the necessary SNR in a package designed for maximum wearing comfort and optimum speech understanding at all times.



## EduLink – the Link to Learn

**EduLink** is a miniaturized FM receiver designed specifically for children with normal hearing thresholds and a normal range of comfort who have difficulties understanding language and learning in background noise and over distance.

**EduLink** is used to complement existing therapies and it ensures that important information reaches the ear as a priority – up to 20 dB louder than the environmental noise.

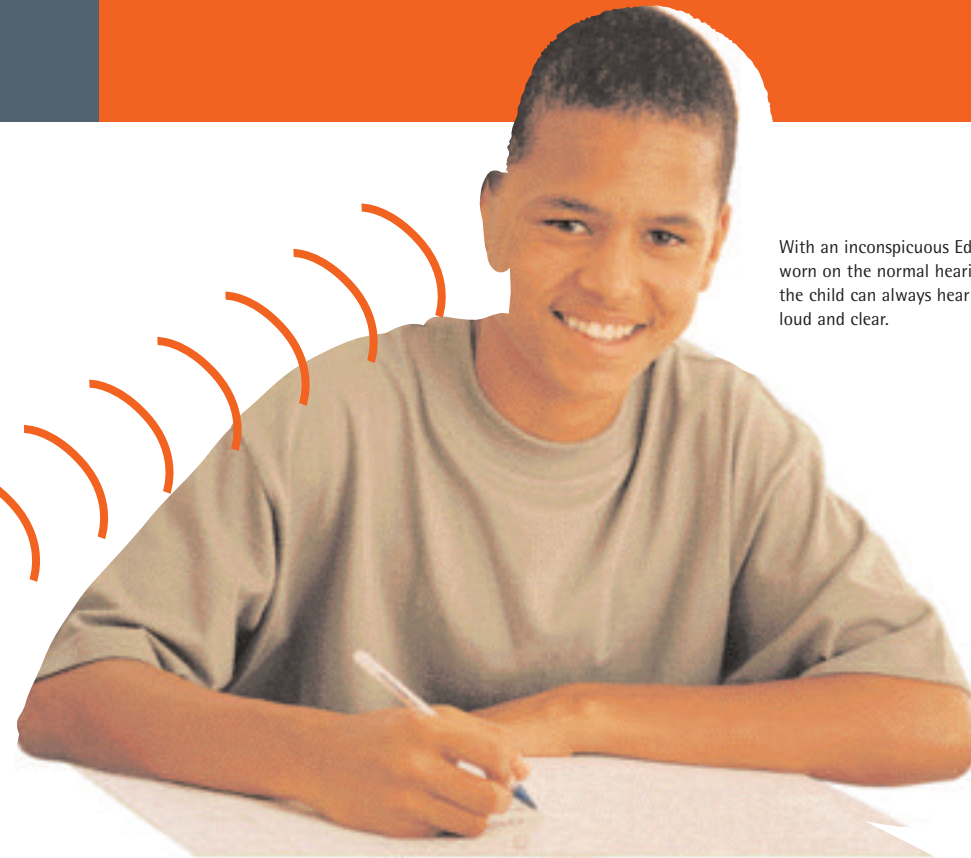
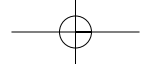
**EduLink** enables the child to hear the teacher's voice at any time without difficulty – even in the most challenging listening situations. **EduLink** helps the child hear all speech sounds more clearly and train his or her auditory and language skills in-depth.

**EduLink** is typically fit on the good ear, when the impaired ear has a moderately severe to a profound hearing loss. For other degrees of hearing loss, the hearing care professional may decide to use a different approach.



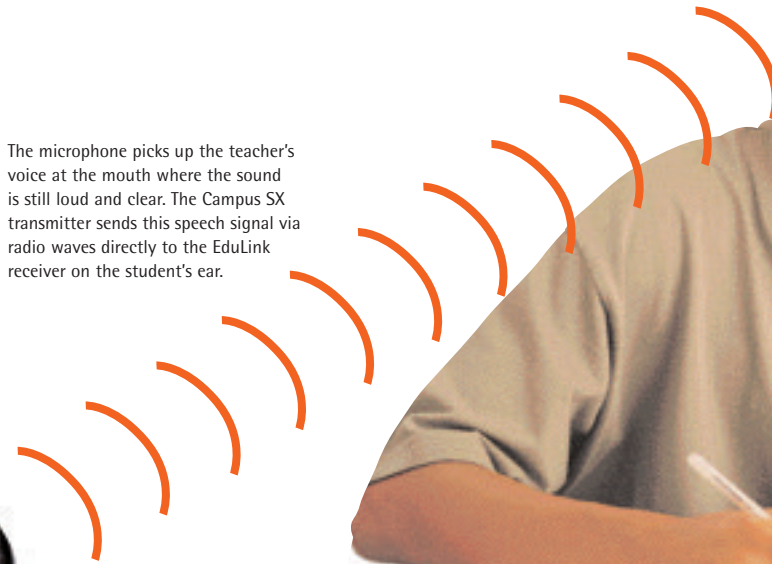
Thousands  
of children  
in the world are  
wearing **EduLink** already,  
in the  
**classroom**  
and at **home.**

“I really like EduLink. I can hear the teacher better and my friends think it is really cool.”  
Julian Kruger, student



With an inconspicuous EduLink receiver worn on the normal hearing ear, the child can always hear the teacher's voice loud and clear.

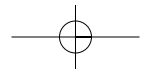
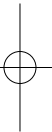
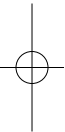
The microphone picks up the teacher's voice at the mouth where the sound is still loud and clear. The Campus SX transmitter sends this speech signal via radio waves directly to the EduLink receiver on the student's ear.



The teacher carries a small FM transmitter and a microphone. The ultra lightweight MicroBoom has an ingenious design and offers optimum wearer comfort and the best signal-to-noise ratio.



EduLink features a contemporary design, similar to the latest cell phone headsets. This guarantees acceptance by the child wearing the device as well as by other children in the class. EduLink is compatible with all Phonak transmitters.





“Because of Sarah’s Unilateral Hearing Loss, we looked at what we could do to help in terms of reducing disturbing behaviors. This has improved the learning atmosphere in our classroom dramatically for all of us.”

John Hiller, teacher

## Listening and Learning Tips

These tips address some general communication aspects as well as suggestions for optimal EduLink use.

EduLink proves to be excellent in any situation where background noise, reverberation or distance cause the speech signal to be less clear. The following may be considered typical EduLink situations: classroom learning, family or school outings, watching television, dinner table conversations, bicycle or hiking trips etc. In addition, because of its output limiting system, EduLink will guarantee listening safety for the normal hearing ear – transforming all incoming sounds to acceptable loudness levels.

When you and your child, student or friend are not wearing the FM system:

- Always approach and speak to the child on the good-ear side;
- Reduce or move away from background noise. Create awareness in school and at home to allow communication in as noise-free an atmosphere as possible;

- Speak clearly at a maximum distance of 3 to 6 feet of distance (1-2 meters);
- Do not overarticulate. Exaggerating your mouth movements distorts the sounds of speech and the speaker’s face, making the use of visual cues more difficult;
- Be aware that it is normal for the child or student to feel fatigued after classes, since he or she must work harder to keep up with the information presented.

For optimal listening and learning, the following communication strategies may prove to be very helpful for your child, student or friend:

- Watch the speaker, even if you find listening to be relatively easy – visual cues from the face and mouth provide valuable extra information;
- Ask the speaker for more details or to rephrase when you did not understand everything;
- Make use of context cues.



**LOCALIZING A SOUND:**

- For this activity, the player is blindfolded.
- The hearing player closes one ear with his/her finger.
- The partner player stands, sits or lies down somewhere in the room the player is in. For variation: the partner player changes to another room.
- The partner player can speak or hum at a normal voice level. For variation: background noise (such as the radio playing, the vacuum cleaner switched on) can be added.
- The player tries to identify the location of the partner player as precisely as possible.
- If this grid activity is too difficult, the child with UHL may ask someone for help.

**ROLL THE DIE AGAIN AND PROCEED THE NUMBER OF SQUARES INDICATED BY THE DIE****ROLL THE DIE AGAIN AND GO BACK THE NUMBER OF SQUARES INDICATED BY THE DIE****TAKE A BREAK AND WAIT FOR YOUR NEXT TURN TO ROLL THE DIE AGAIN****TAKE A LONGER BREAK AND SKIP A TURN****QUIZ QUESTIONS: THE PARTNER PLAYER MAY SELECT ONE OF THE QUESTIONS LISTED BELOW.****UNDERSTANDING OVER DISTANCE AND IN BACKGROUND NOISE:**

- For this activity, the player is blindfolded.
  - The hearing player closes one ear with his/her finger.
  - The partner player stands, sits or lies down somewhere in the room the player is in. For variation: the partner player changes to another room.
  - The partner player speaks a sentence (approx. 4–5 words) at a normal voice level. Soft background noise (such as the radio playing softly or two or more other players softly repeating saying "rubbadubbah").
  - The player repeats the sentence spoken by the partner player as precisely as possible
  - When this challenge is too difficult, the partner player may give hints or tips for more clues.
- What is a "decibel"?
  - Name one thing a child with Unilateral Hearing Loss will have difficulties with
  - Give an example of a soft sound
  - Give an example of a loud sound
  - What is an FM system?
  - Name one thing you and your child, student, brother/sister or friend can do when you are not wearing the FM system?
  - Approximately, how many children all over the world have Unilateral Hearing Loss?
  - Why are students with Unilateral Hearing Loss at risk in the classroom?

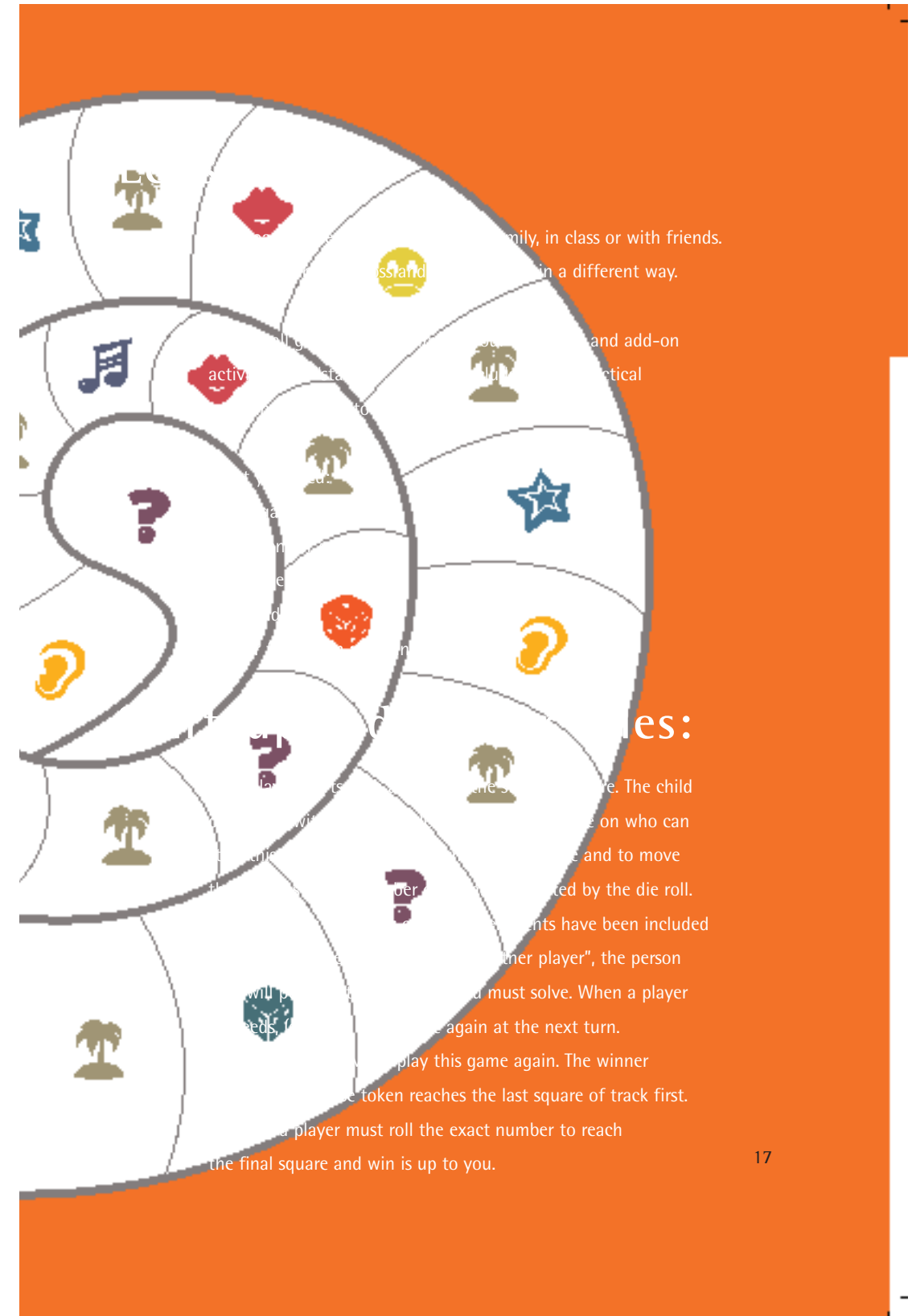
**RECOGNIZING A SONG:**

- Ask your game partner to hum a song and try to guess which one it is.

**LIP-READING:**

- The partner player carefully selects a word. Remember: words with more than 1 or 2 syllables are easier, so are words containing more visible sounds with articulation more in the front of the mouth, (e.g. m, th, l, f, p/b,...) or more "extreme" articulation (e.g. a, o, ee,...).
- Starter words: elephant, potato, rainbow, teddy bear
- The player closes both ears
- The partner player whispers the word





family, in class or with friends.

ssland in a different way.

and add-on  
tical

### es:

The child  
on who can  
and to move  
by the die roll.  
ents have been included  
"other player", the person  
must solve. When a player  
again at the next turn.  
play this game again. The winner  
token reaches the last square of track first.  
a player must roll the exact number to reach  
the final square and win is up to you.

# EduLink™

The  
Link  
to  
Learn

## Improving Learning and Understanding

- Children with Unilateral Hearing Loss can rely on one ear only
- Because of this, they will have difficulties understanding in challenging listening situations such as in the classroom or in conversations involving several people
- This endangers classroom learning and can put the child at risk for academic, speech-language, social and emotional problems
- An enhancement of the signal-to-noise ratio by 15 to 20 dB as part of existing therapies will provide the child optimum access to the speech signal
- EduLink represents an attractive and effective way of increasing speech understanding in background noise and over distance

More information on EduLink is available on the internet:  
[www.phonak.com/EduLink](http://www.phonak.com/EduLink) and [www.eSchoolDesk.com](http://www.eSchoolDesk.com)



The Phonak Group specializes in the design, development, production and worldwide distribution of technologically advanced hearing systems. The combination of expertise in hearing technology and a strong distribution network allows Phonak, along with its customers and business partners, to make a substantial improvement in the quality of individuals with hearing impairment.

With a market share of 88% worldwide, the Phonak Group is the major player for wireless communication in the hearing health care market.

**PHONAK**  
hearing systems