

# Let's Talk About...

**M**any states, including Utah, require all newborns to receive a hearing test. This will help children who have hearing loss to receive early and more effective care. This handout explains sound and hearing tests. There is a chart located on the inside pages. This chart will help explain some of the topics. Your child's doctor or audiologist can answer any questions you might have.

## What is sound?

Every sound has two parts: **frequency** (pitch) and **intensity** (loudness).

### Frequency (pitch)

Thinking of a piano is a great way to understand frequency. The notes on the left side of the piano are low-frequency (low-pitch) notes. The notes on the right side of the piano are high-frequency (high-pitch) notes.

Frequency is measured in hertz (Hz). A low-frequency sound is about 500 Hz and lower. A high-frequency sound is about 2000 Hz and higher.

A bass drum, a "rumble," thunder, or a deep man's voice are all examples of low-frequency sounds. A shrill whistle, squeak, squeal, or high woman's voice are all examples of high-frequency sounds.

### Intensity (loudness)

If a sound is loud, it has a high intensity. If a sound is soft, it has a low intensity.

Intensity is measured in decibels (dB). A high intensity sound (a loud sound) has a high decibel level. A low-intensity sound has a low decibel level and is very soft, like a whisper (about 25 dB). Conversation ranges between 40

## Hearing and testing

and 60 dB. We feel discomfort with sounds over 90 dB, and sounds over greater than 120 dB can be painful.

### What can humans hear?

Humans can typically hear frequencies between 32 Hz and 32000 Hz, and intensities -10dB and louder. This typical hearing range is represented on the chart on the inside pages by the largest shaded box labeled, "**HUMAN HEARING.**"

Hearing "threshold" is the lowest intensity at which we begin to hear sound. The normal hearing threshold is between -10dB and 25 dB.

### Some examples of the sounds around us

Sounds around us have a wide range of frequency and intensity. For example, leaves rustling are very soft, or very low intensity sounds, but they have high frequencies. A jet engine is a very high intensity sound and it is also in the high-frequency area. A cargo truck is very loud (high intensity), but has a low-frequency.

The sounds we make when we speak spread across many frequencies and vary in intensity. Notice on the chart that sounds requiring our voice (z, v, j, m, l, o, i) are more low-frequency sounds. Sounds that are made without our voice (sss, fff, th, t, sh) are more high-frequency sounds.

### How is hearing tested?

There are many ways to test hearing. The most common ways are:

- Audiogram
- Otoacoustic emission (OAE) testing
- Auditory brainstem response (ABR) testing

## **Audiogram**

Older children and adult are usually tested with an audiogram. It tests the range of hearing that is important for communicating. The audiogram is a record of a hearing test. The test measures how high the decibel level needs to be for a person to hear each frequency.

During an audiogram, an audiologist (a healthcare professional who tests and helps people with hearing loss) records a person's ability to hear from each ear. If a person hears sound at 25 dB or less, hearing is considered normal. The range of hearing that the audiogram tests is shown on the chart in the shaded area labeled, "**AUDIOGRAM.**"

## **Otoacoustic Emission (OAE) Testing**

Otoacoustic emission (OAE) testing is used with babies and small children. It is one of the methods used to test the hearing of all newborn babies in Utah. The OAE is done by placing a small probe in the baby's ear. This is not painful. The OAE tests hearing in the frequency range of about 800-4000 Hz. This test can only tell you if hearing loss is present—not what degree (mild, moderate, severe, or profound). The range of hearing the OAE tests is shown on the chart in the shaded box labeled, "**OAE.**"

## **Auditory Brainstem Response (ABR) testing**

When conventional testing cannot be done, the auditory brainstem response (ABR) is used. This is especially helpful with children. This test is usually done after the child has been given a medication to sleep. This is because a child must be completely still for the test to work.

For ABR testing a clicking sound is delivered to the child's ear and the brain's activity is recorded for a certain frequency range (1500-4000 Hz). The intensity of the sound can increase up to about 105 dB. The range of this test is shown on the chart in the shaded box labeled "**ABR.**"

When compared with the broad range of human hearing, the range of this test is somewhat narrow. However, the area that is tested is a very common area for hearing loss.

## **What is hearing loss?**

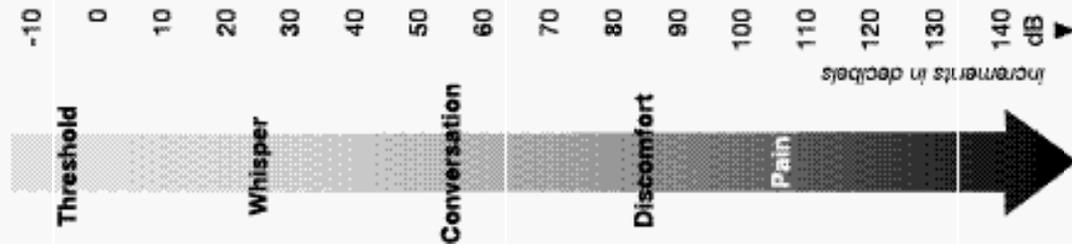
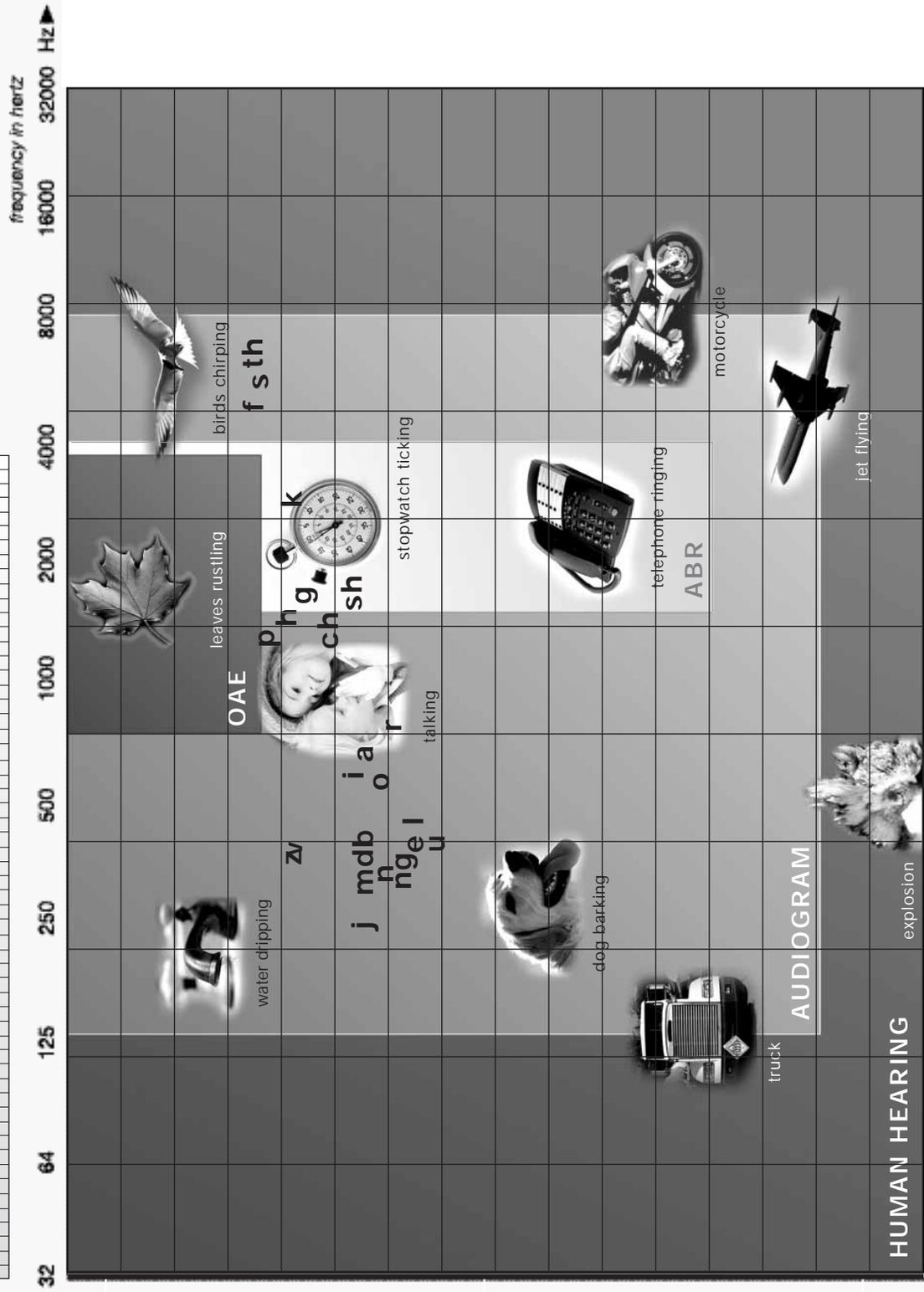
- If a child can hear normally in the low frequencies, but not in the high frequencies, they will be able to hear most of what people say. However they may not hear high-frequency sounds of speech like "sh," "t," and "f." Without hearing aids, this child may not develop the sounds of speech she doesn't hear.
- If a child has mild or moderate hearing loss in all frequencies, normal conversation may sound like a whisper. If the hearing loss is permanent, the child may have to have hearing aids.
- If a child has a severe hearing loss throughout all frequencies, she will have to have hearing aids to hear conversation.

## **Programs for hearing impaired children**

At Primary Children's Hospital, we think spoken language should be the first option for hearing impaired children. Because our culture depends on the use of spoken language, our Speech/Language and Hearing Centers will provide every opportunity to help your child develop spoken language. We believe that hearing aids are the best way to have children develop normal language because hearing aids allow children to hear the sounds they need to imitate.

A successful program for hearing impaired children needs to include the following:

- Early identification (best within six months of the hearing loss)
- Enthusiastic involvement of parents and family
- Appropriate fitting of hearing aids



-10

0

10

20

30

40

50

60

70

80

90

100

110

120

130

140

dB

frequency in hertz

32000 Hz

18000

8000

4000

2000

1000

500

250

125

64

32



birds chirping

f s th



leaves rustling



Ph g k

ch sh

stopwatch ticking



talking



water dripping

z/

j m db

n g e l

u

i a r



dog barking



telephone ringing

ABR



truck

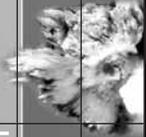
AUDIOGRAM



motorcycle



jet flying



explosion

HUMAN HEARING

- Development of listening skills through strong aural rehabilitation therapy
- A natural approach to language
- Speech sound intervention

### **What if I have other questions?**

If you have any questions about your child's hearing, please talk with your child's doctor or an audiologist at Primary Children's Speech/Language and Hearing Centers. Please contact the location closest to you for an appointment:

#### **Primary Children's Medical Center**

100 North Medical Drive  
Salt Lake City, UT  
(801) 662-4941

#### **Primary Children's Medical Center Rehab West**

3845 West 4700 South #102  
Taylorsville, UT  
(801) 840-4360

#### **Primary Children's Medical Center Rehab North**

280 North Main  
Bountiful, UT  
(801) 292-8665

#### **Primary Children's Medical Center Rehab South**

870 East 9400 South, #112  
Sandy, UT  
(801) 571-1223



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