A baby’s ears have a very specific function – namely to receive auditory information. Dr. Melodie De Jager, founder of the BabyGym Institute, adds that optimal hearing also assists a baby to ‘tune in’ to relevant sound and to learn to ‘tune out’ to irrelevant sound, as well as to develop a sense of rhythm and timing (2011:106). Hearing helps a baby to orientate himself in space and enables a baby to determine from which direction sound is coming. Our sense of hearing ultimately helps us to learn to look, listen and talk to others, which makes it easier to build relationships and experience a sense of belonging. When a baby experiences any form of hearing problems, it can disrupt not only the sensory processing of information from other senses, but also a child’s physical, emotional and cognitive development.

The development of the Auditory System
The development of the auditory system is a complex and multistage process that begins in early embryonic life (Schnupp, Nelken & King, 2011:270). From the 24th week of pregnancy babies can ‘hear’ a restricted range of lower- to medium frequency sounds, which roughly correspond to the range of the human voice and the majority of musical instruments used in classical music. All sounds heard inside the womb are reduced in volume by about 30%, the loudest sound being that of the mother’s heartbeat (Goddard Blythe, 2004:201; Goddard, 2011:38).

Although the beginning and major changes of the auditory system take place in utero, the development does not conclude, nor is it totally complete at the time of birth. There appears to be three successive stages of auditory development in humans.

Moore and Linthicum (2007) summarises the first phase as the three months of the second trimester where myelination occurs only in the intra-cochlear portion of the cochlear nerve, while the cochlea reaches virtually full maturation. In the second phase, the perinatal period (third trimester to the sixth postnatal month), there is myelination of the brainstem pathway from the cochlear nerve to the thalamus. The third phase of development, with progressive myelination of the auditory cortex is a decade-long course lasting through early and later childhood.

Infancy and childhood are times of major change in auditory processing, most notably the acquisition of receptive speech (Moore & Linthicum, 2007). During the first three years of life, a child learns to use his ears to “tune-in” to the specific frequencies of his own language. Goddard (2005:65) explains this as much the same way that a radio is adjusted to select specific stations. It is also during this time that the child has the potential to learn any language if exposed to the sounds of that language continuously over a period of time. It becomes far more difficult to assimilate a new language after the age of three years, when these fine tuning adjustments should have been made.
A mechanical system

The auditory system is a mechanical system that decodes acoustic energy into sound. It does this by passing sound waves down through the ear until specialised cells are able to translate the sound into a code that is interpretable and comprehensible by the brain (Bear, Connors & Paradiso, 2007:348; Bhise & Yadav, 2008:12.2).

As shown in figure 1, the first structure in the auditory system is the external or outer ear. The pinna is the part of the ear that can be seen and serves to funnel sound into the ear down the auditory canal to the middle ear (Hakala, 2009:61). The purpose of the auditory canal is to focus all the sound waves toward the tympanic membrane (the eardrum). This membrane, which is a thin tissue stretched out over a bone, will vibrate when sound waves beat against it and transmits the waves to the middle ear (Hakala, 2009:62; Sherwood, 2010:216; Vera-Portocarrero, 2007:24).

The structures within the middle ear are the tympanic membrane, the ossicles, and two tiny muscles attaching to the ossicles. The tympanic membrane is fairly conical in shape, with the point of the cone extending into the cavity of the middle ear (Bear et al., 2007:348). The Eustachian tube runs from the middle ear into the nasal cavity and ensures an equal degree of atmospheric pressure on both sides of the tympanic membrane. This is necessary to preserve the eardrum’s sensitivity to sound waves, as the drum loses some of its vibratory capacity if the atmospheric pressure differs (Bhise & Yadav, 2008:12.2; Sherwood, 2010:217).

The vibrations of the tympanic membrane are carried further into the ear via the three smallest bones (ossicles) in the human body. These small bones are known as the malleus (hammer), incus (anvil) and stapes (stirrup). These three bones will then in return vibrate to the sound waves that are causing the tympanic membrane to vibrate (Hakala, 2009:62), and transmits the sound from the tympanic membrane to the fluids of the cochlea in the internal ear (Bear et al., 2007:349; Bhise & Yadav, 2008:12.2; Kolb & Whishaw, 2009:210; Vera-Portocarrero, 2007:25).

The inner or internal ear, where the auditory receptors are to be found, is fluid filled and is made up of the cochlea, utricle, the saccule and the three semicircular canals. While the cochlea is considered the main sensory organ for hearing, the other parts provide important information for balance (Bhise & Yadav, 2008:12.2). The cochlea has a bony, coiled tube of two-and-a-half turns and has the shape of a snail (see figure 1). It is fluid filled and the basilar membrane floats in this fluid, in the middle of the cochlea. The vibrating stapes presses against the fluid in the cochlea and causes waves to flow in the fluid, which in return causes the basilar membrane to vibrate. On the basilar membrane are receptor cells (hair cells), which are embedded in a part of the basilar membrane, called the organ of Corti. The axons of the hair cells leave the cochlea to form the major part of the auditory nerve, the eight cranial nerve (Kolb & Whishaw, 2009:211-112). The vibrations of the basilar membrane then stimulate the hair cells.
These patterns of stimulation are then transmitted along the basilar membrane along the auditory nerve, to the auditory cortex (the temporal lobes of the brain) (Bear et al., 2007: 351 – 352; Hakala, 2009:62; Kolb & Whishaw, 2009:212).

How can parents develop their baby’s hearing?
BabyGym® offers mothers information and demonstrates activities that aids in the development of baby’s quality of hearing. Babies just love their mothers, fathers or caregivers voice- and parents should be encouraged to sing and talk to their babies many times a day.

Aim to keep good eye-contact and over exaggerate facial expressions to your baby’s delight! Dr. Melodie De Jager emphasizes the benefits of massaging your little one’s earlobes between your fingers and thumbs (2011:107). This massage promotes the wiring between the earlobes and the brain and by doing this a baby’s touch, inside sensory and hearing maps are enriched. Strong neck muscles are a big step towards good hearing – so tummy time is essential. Numerous more easy-to-follow, yet powerful activities are demonstrated during a BabyGym® 2 Firm Foundations course.

Many toddlers and young primary school children show signs of poor listening skills and even auditory processing difficulties. It is therefore vital that parents are informed about the development or their children’s hearing and optimize stimulation during the first three critical years of life.

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