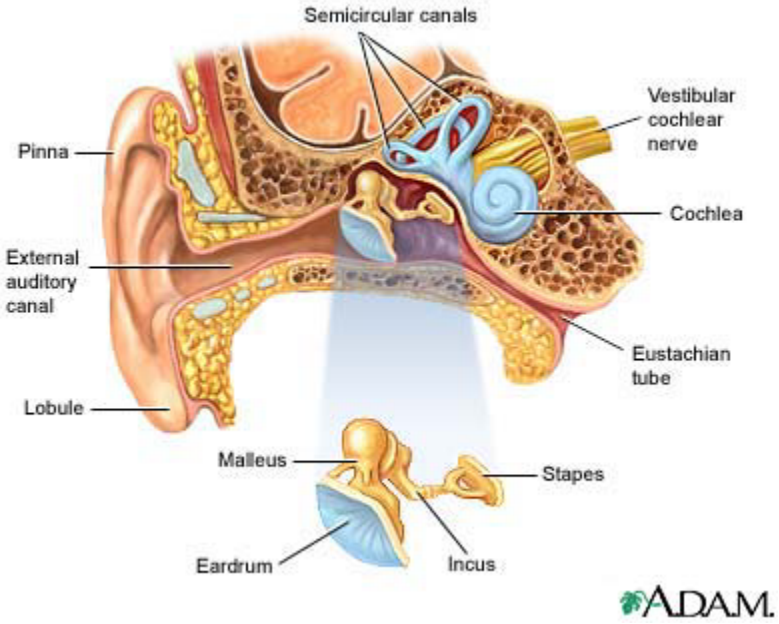
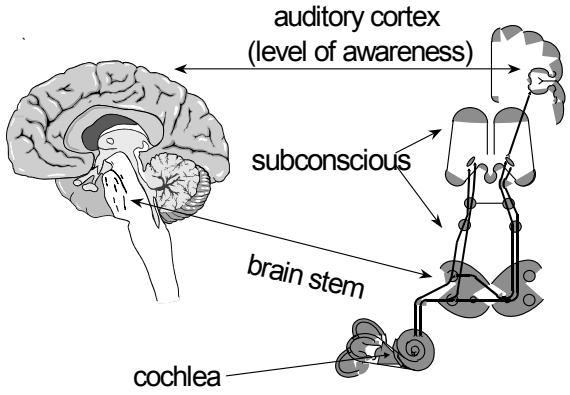
Illustrations used in TRT counselling



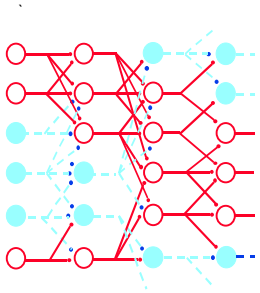
The cochlea changes sound waves into electrical impulses in the 30,000 fibres of the cochlea / auditory nerve. At this point all sounds from outside are mixed together.

Auditory pathways



The subconscious auditory pathways consist of nerve (neuronal) networks, not cables like the cochlea nerve. They begin the process of sorting frequency information and reconstructing the individual sound sources in our environment, before perception occurs.

Neuronal networks

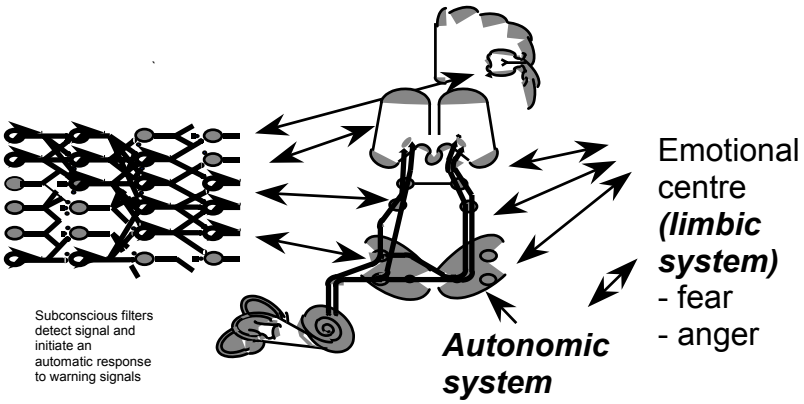


Enable pattern recognition
-sound of own name
-baby waking

ESSENTIAL for THREAT DETECTION
-creaking floor board
-motor horn
-predators (weak signal)

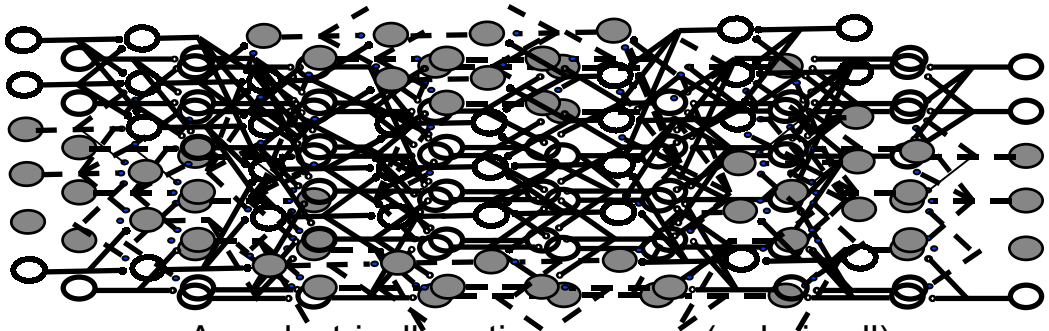
Neuronal networks process fast and furiously. They enhance detection of important signals and suppress unimportant everyday sounds (auditory junk-mail). This processing generates its own electrical activity. Neurones are never silent, and many become more active in silent environments. This is one form of compensatory activity. A hearing loss can have a similar effect.

Extra auditory processing: conditioned response



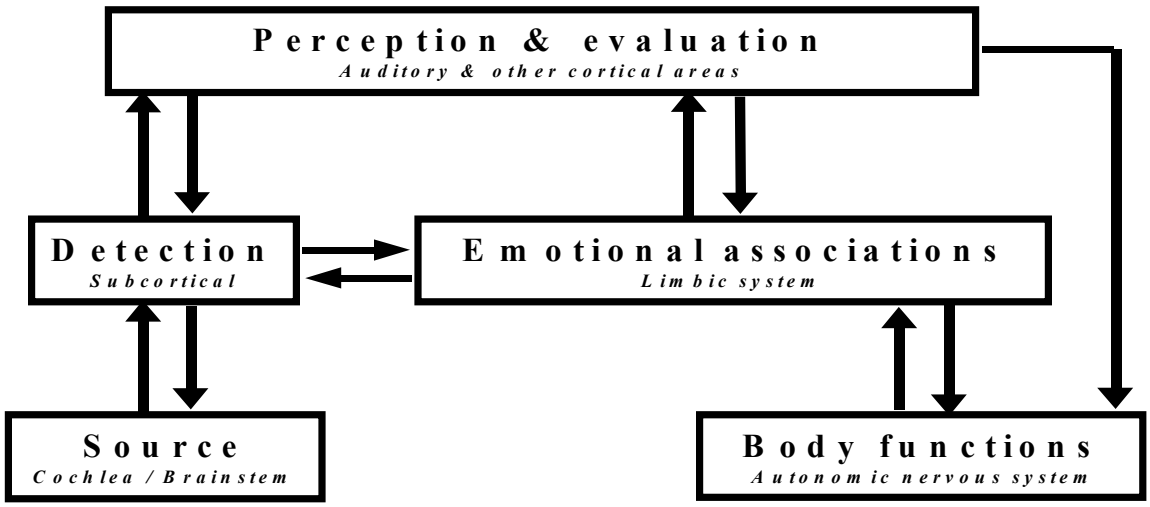
Warning signals produce a very important 'survival style' reflex. This is conditioned in a way that we cannot turn it off. If we could our security would be compromised

Where does the tinnitus signal come from?



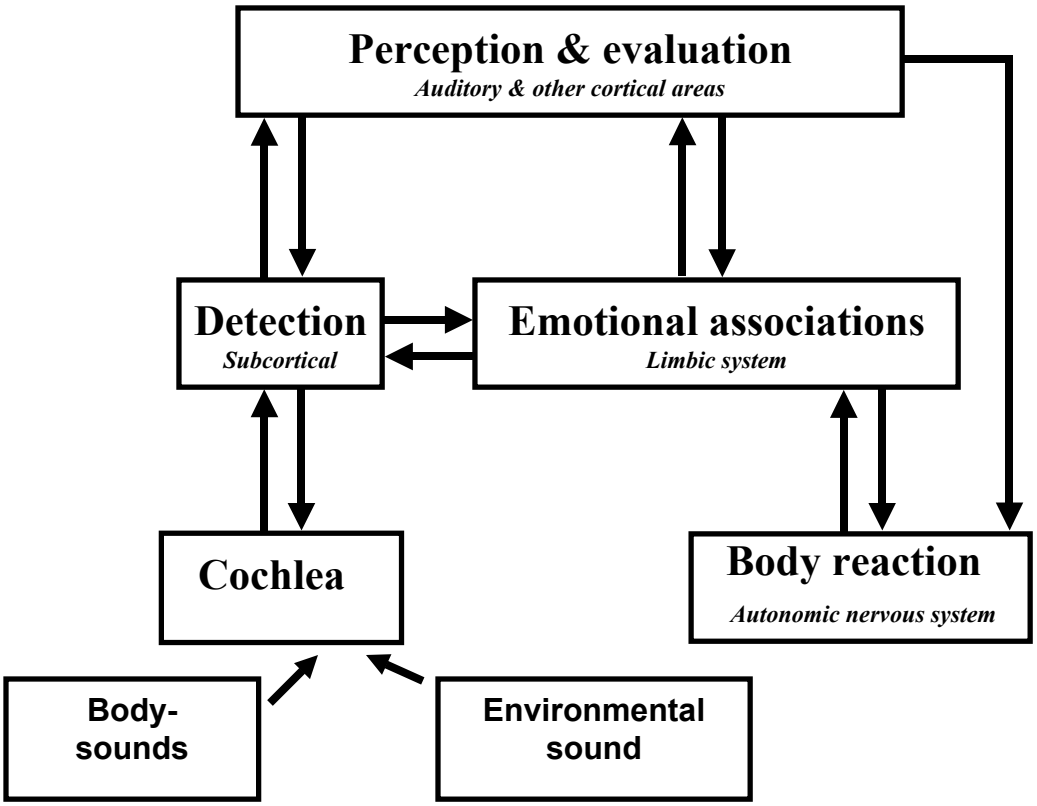
Any electrically active neurone (or haircell)

All hearing perception comes from patterns of electrical activity in neuronal networks in the auditory pathways. When these patterns originate in the cochlea as a result of sound stimulation, we hear our environment. When we detect spontaneous 'compensatory' activity generated within the pathways – that is tinnitus.



The Jastreboff Model

This diagram of the Jastreboff model shows how the universal experience of tinnitus can become persistent, if an aversive conditioned response to the sound is generated. Because of negative evaluation or association of the tinnitus sound, the connections with the limbic and autonomic system are greatly strengthened, and this in turn enhances detection of these otherwise weak signals, preventing their habituation. It is the limbic and autonomic systems which produce the symptoms associated with persistent tinnitus, not the sound itself.



In **decreased sound tolerance** the mechanism is the same as tinnitus, but the source is external to the auditory system. It may be a body sound (e.g. blood flow, muscle twitching, breathing, etc., so-called 'somatosounds'), or a sound from the outside environment (e.g. traffic, aircraft, certain music, kitchen sounds, paper rustling, noisy eating etc..). They usually are not loud to other people. In hyperacusis external sounds are 'amplified' because of enhanced activity in the auditory pathways. In misophonia (dislike of sound) and phonophobia (fear of sound) there is enhancement of the connections with the limbic and autonomic nervous system. In practice phonophobia / misophonia and hyperacusis nearly always occur in combination to some extent. Hyperacusis increases the loudness perception of ALL sounds. Misophonia / phonophobia produces an aversive reaction to a specific sound (or sounds).

In every case the underlying problem is one of auditory, and/or extra-auditory processing, which can be fixed by habituation based therapy (e.g. TRT)