

Letter to the Editor

Hearing aids, audition, cognition, ageing and listening success: a philosophical aspect

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To the Editor

Human life expectancy has increased dramatically. In 1900 the average life expectancy was 47 years of age. In 2009 average life expectancy is 60 years with 28% increase in just for a century. As human life expectancy increases so do health related problems attributed to ageing such as cognitive decline hearing loss and other maladies. I want to address the interaction and co-dependence of audition and cognition in the ageing person. The core concept is that the sensory driven auditory input drives the entire cognitive system. The brain primarily processes and responds to auditory stimuli which are perceived and processed. However even after successful audibility restoration via amplification, speech understanding in noise remain challenging for many hearing impaired listeners. This is because speech understanding requires more than audibility; it requires top-down and bottom-up system to interact and work together efficiently and effectively. Within this frame work, the role of the audiologist is to maximize the sensory driven auditory input through effective and efficient products and oral rehabilitation strategies.

As ageing progresses, the potential for cognitive and auditory decline increases. With regard to cognitive decline by the age 70 to 75 years, half of all will develop some sort of dementia. The most common dementia is Alzheimer's disease (AD). AD can affect short term and long term memory. 10-20% of all people aged 65 years and older may have mild cognitive impairment (MCI). With regard to auditory decline, one out of ten Americans have hearing loss including 15% of all people between the ages 45 – 64 years of age and 29% of all people over the age of 65. Sensory neural hearing loss (SNHL) is typically accompanied by inherent cochlear distortion which impact frequency and temporal resolution while cochlear dead zone/ regions may add to these distortion. As distortion increases, hearing aids are likely to be less satisfactory particularly in the most challenging situations, such as listening in competing noise.

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When Cognitive abilities decrease (for example AD and MCI) in tandem with decreased auditory ability (for example age related and noise induced hearing loss) the two deficits may create negative synergy such that the total impact could be greater than anticipated by simply summing the two deficits. Therefore cognition matters more as audition declines and audition matters more as Cognition declines.

Many adults with normal cognitive function and mild to moderate SNHL manage their sensory-neural hearing loss through compensatory strategies. They literally 'fill-in-the gaps' based on their knowledge of language, vocabulary, linguistic structure and their ability to incorporate efficient memory processes and abilities seamlessly to meet the 'real time' ongoing processing demands. Working memory (WM) is a limited capacity which facilitates short term processing, storage and retrieval of new sensory information. Researchers and authors have identified 'working memory' as one of the most important component of cognition relating to speech perception & there is a link between cognition and speech recognition in noise. The audiologist's role therefore, is to provide maximum sensory information in order to facilitate cognitive processing and to maximize listening success. Cognition friendly amplification (CFA) is simply a hearing aid fitting philosophy which reflects the symbiotic relationship between audition and cognition.

Extended bandwidths allow improved sound quality for speech and music as well as providing important high frequency acoustic cues which facilitate localization. Extended bandwidths have been shown to increase phoneme identification in children with and without hearing loss. Advance technology feedback management incorporates pre-emptive detection and phase reversal of the feedback spike to quickly and effectively eliminate acoustic feedback before it becomes audible.

In some respects, the auditory input to the brain might be thought of as 'acoustic nutrition'. The more we deliver the 'good stuff' to the brain, the better the opportunity for listening success. Because the bottom-up sensory based system drives the entire cognitive process as it relates to understanding speech in difficult and noisy backgrounds, it is paramount that we incorporate CFA into our hearing aid fitting protocols.