

The Thrifty Phenotype Hypothesis and Hearing Problems

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According to the thrifty phenotype hypothesis, events during fetal life, such as malnutrition, may cause disease in adulthood. The malnourished fetus makes metabolic adaptations, which may become permanently programmed, persisting and causing disease later in life.

The mechanisms behind the thrifty phenotype hypothesis are unclear, but links to insulin-like growth factor I (IGF-I) have been suggested. During development, IGF-I is crucial for several organs. This includes: the size of the cochlea and auditory neurons; the innervation of the auditory sensory cells; and the postnatal survival, differentiation, and maturation of auditory ganglion cells.

Sensorineural hearing loss (SNHL) in adulthood may be programmed at birth due to low IGF-I concentrations during fetal life. Adaptation of the growth hormone leads to reduced IGF-I levels and to fewer mitoses per unit time (cell cycle delay).

In birth and adolescence, this results in a reduced number of cells in the skeleton, cardiac vessels, arteries, and ears, small size for gestational age, short stature, and minor sensorineural hearing loss. In adulthood, low IGF-I levels may lead to earlier onset of age-related disorders.

Twenty million Americans have sensorineural hearing loss, but only 4 million of those use hearing aids, the main form of treatment for this condition.

An unprecedented clinical trial comparing the effectiveness of three types of commonly used hearing aids shows that all provide substantial improvement for individuals with bilateral sensorineural hearing loss.

Hearing aids used during the clinical trial included: **linear peak clipper (PC)**--amplifies input sounds linearly up to its maximum output capabilities, such that when input sounds go up by 10 dB, so do output sounds; **compression limiter (CL)**--amplifies input sounds linearly up to a predetermined level, however after a certain

point, the output is reduced automatically by a fixed ratio; and **wide dynamic range compressor (WDRC)**--allows input signals that vary in level over a wide range to be amplified as a narrower range of output signals.

Researchers found that all three hearing aid circuits improved speech recognition of one-syllable words by an average of 29 percent, improved recognition of connected speech by 10 to 30 percent with the greatest improvement for speech at soft and conversational levels, and significantly reduced the frequency problems in verbal communication.

The differences among the circuits were small. Both CL- and WDRC- based hearing aids performed slightly better than PC circuits in terms of volume, lack of distortion, word recognition, and background noise. Just over 41 percent rated the CL circuit as most preferred, with WDRC- and PC-based circuits preferred by 29.8 and 28.6 percent, respectively.

The cost of hearing aids can range from \$1,600 to \$3,000. While most insurance companies pay for the hearing exam, they do not cover the cost of the device. Adjusting to hearing aids takes time, practice, and patience, but the results will be worthwhile.

References

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