Risk factors for neurodegeneration of brain, eyes, and ears: from genetics to society

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Global Sensory Impairment in Older Adults in the United States
Camil Correia et al.

Estimated Prevalence Among Older U.S. Adults

Association Between Impairments
- Observed
- Expected

No impairments
Multiple impairments
Severe visual and hearing impairments assessed by visual acuity (VA) and pure-tone average (PTA)

332 patients with hip fractures from October 2004–July 2006
Genetic and Epigenetic

Environmental exposure

Comorbidity
hypertension and cardiovascular disease, cerebrovascular disease, smoking, diabetes, autoimmune

Information Processing
Plasticity

Neurodegenerative diseases
The Domains of Brain Resources

Total Capacity, Resource Allocation, Plasticity, Functional Reserve

- Dual Task creates competition for brain resources
- In young and healthy individuals, additional resources can be pulled from reserve (plasticity)
- In older individuals functional resources and plasticity are constrained, leading to dysfunction
Genetic and Environmental Influences on Self-Reported Reduced Hearing in the Old and Oldest Old.

Tetrachoric Correlation for Reduced Hearing in Danish Twins
Age 70 and Older

* p<.05
The Heritability of Age-Related Cortical Cataract: The Twin Eye Study

506 twin pairs, 226 monozygotic (MZ) and 280 dizygotic (DZ) (age 40-79) from the St. Thomas’ United Kingdom Adult Twin Registry (UK)
Pollution
Synopsis

- Performance in Vision and hearing decline with aging. Whether the rate of decline in these dimensions are longitudinally correlated is uncertain.

- Mechanisms of joined decline are not understood, likely multifactorial.

- Neurodegenerative disease often cause sensory function impairment.

- Sensory problem have genetic, behavioral or environmental factors.

- Mechanisms for effect on the brain:
  - Reduction of sensory function may overload the brain circuitry by pulling excess resources to cope with the poor signal to noise.
  - Long term deafferentation may also contribute to a progressive decline of brain integrity.
  - Multiple sensory impairments may be affected by the same disease.

- Most literature focuses on vision and hearing, smell and taste decline are important as well and connected to diseases.

- Multiple sensory impairments should be studied from a multidisciplinary perspective, especially in older persons.