Impact of Bilateral, Single-Sided and Asymmetrical Hearing Loss on Cognitive Functions

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Aims

Aim of the study was to investigate the impact of single sided, asymmetrical and bilateral sensorineural hearing loss on cognitive and psychological functions of postlingually hearing impaired adults.

It was hypothesised that normal hearing (NH) participants would perform significantly better than participants with severe-to-profound hearing loss (SPH), single-sided deafness (SSD) and asymmetrical hearing loss (ASH) in cognitive assessments (executive function, working memory, verbal recognition memory and episodic memory and learning) and psychological functions (depression, anxiety and stress).

Background

- Hearing loss is one of the most commonly seen health conditions globally; over 320 million people have a disabling hearing loss (WHO, 2012).
- Hearing loss has been linked to cognitive decline (Lin et al., 2011).
- Single sided deafness (SSD) is defined as a severe-profound sensorineural hearing loss in the poorer ear, with hearing thresholds (≤30 dB HL to 4,000 Hz inclusively) in the opposite ("better-hearing") ear (Vincent et al., 2015).
- Studies using both animals and humans with SSD using AEP and fMRI have shown greater symmetry in activation of the auditory cortices upon monaural stimulation (Hanss et al., 2009). These changes may to a certain extent account for the perceptual and sound recognition difficulties faced by individuals with SSD. However, impact of neuro-pathophysiological changes associated with SSD on cognition is yet to be determined.

Methods

Participants:

- 22 normal hearing participants (NH, M = 57.26 ± 7.88 years),
- 15 bilateral severe-to profound hearing loss participants (SPH, M = 58.65 ± 18.47 years),
- 6 asymmetrical hearing loss participants (ASH, M = 64.50 ± 10.17 years) and
- 9 single sided deafness participants (SSD, M = 58.10 ±14.26 years) were recruited.

Materials:

- Hearing assessment
- Cognitive assessment of executive function, attention switching, spatial working memory, strategy use, episodic memory and learning & verbal recognition memory tasks (Cambridge Cognition, Ltd),
- Depression, anxiety and stress questionnaire (DASS-21, Lovibond & Lovibond, 1995).

References

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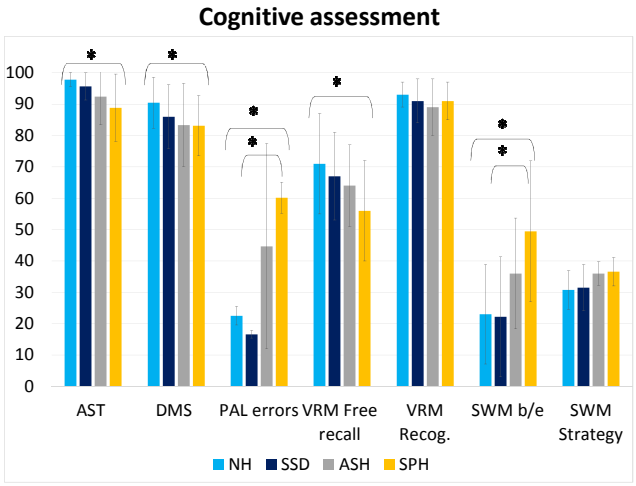
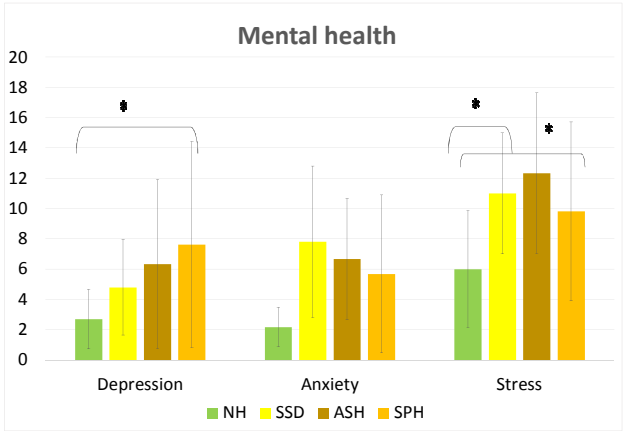
Results

- Linear regression analysis was conducted to investigate the effects of hearing loss on cognitive functions of the participants.
- Results were controlled for age, education level depression scores. Hearing levels predicted the performance on working memory tasks working memory [F (4, 47) = 9.09, p < 0.001, R = 0.66, R2 = 0.43, and adj.R2= 0.17].
- Analysis of Variance (ANOVA) results revealed that the SPH group performed significantly poorer than NH group in majority of the cognitive assessments and depression and stress scores.
- SSD performed poorer than NH groups on executive function (AST mean correct latency , p = 0.04) and episodic memory and learning (PAL- total errors 6 boxes, P <.001) tasks.





Discussion and Conclusions

- Hearing loss significantly negatively impact on number of cognitive function including executive functions, working memory, and verbal recognition memory.
- SPH had more impact on the measured cognitive functions compared to SSD & ASH.
- SSD affects executive function and episodic memory and learning.
- SPH significantly negatively impacts depression and stress.
- SSD significantly increases stress compared to NH.