

The Effect of Ageing and Hearing Impairment on Spatial Processing

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Background Information

- A high percentage of hearing impaired people struggle to understand speech in the presence of background noise (Dubno et al, 2002).
- Difficulty understanding speech should be considered one of the most incapacitating elements of hearing loss, given its potential to cause feelings of isolation (CHABA, 1988).
- Spatial processing deficit (SPD) is a major cause of difficulty understanding speech in background noise in a percentage of normally-hearing children (Cameron & Dillon, 2008).
- SPD is a deficiency in the ability to selectively attend to sounds arriving from one direction and suppress sounds arriving from other directions.
- The Listening in Spatialized Noise-Sentences Test (LiSN-S) has been adapted to include a prescribed gain amplifier so it can be used to assess hearing impaired people.

Aims

1. Investigate the prevalence of SPD in hearing impaired people.
2. Investigate the effect of age, cognition and degree of hearing loss on spatial processing ability.
3. Examine the relationship between spatial processing ability and self report measures of difficulty in background noise.

Methodology

Participants: 160 children and adults (aged 6 to 90 years) with a mild to moderately-severe sensorineural hearing loss in the worse ear.

Procedure: The following tests are completed in an 1.5hr session;

- Pure tone audiometry
- Real ear insertion gain
- The Neurobehavioral Cognitive Status Examination (COGNISTAT) – *Adult participants only*
- The LiSN-S with prescribed gain amplifier
- Speech, Spatial & Qualities of Hearing questionnaire (SSQ) – *Adult participants only*
- The Listening Inventory For Education: Student Appraisal (L.I.F.E) – *Child participants only*

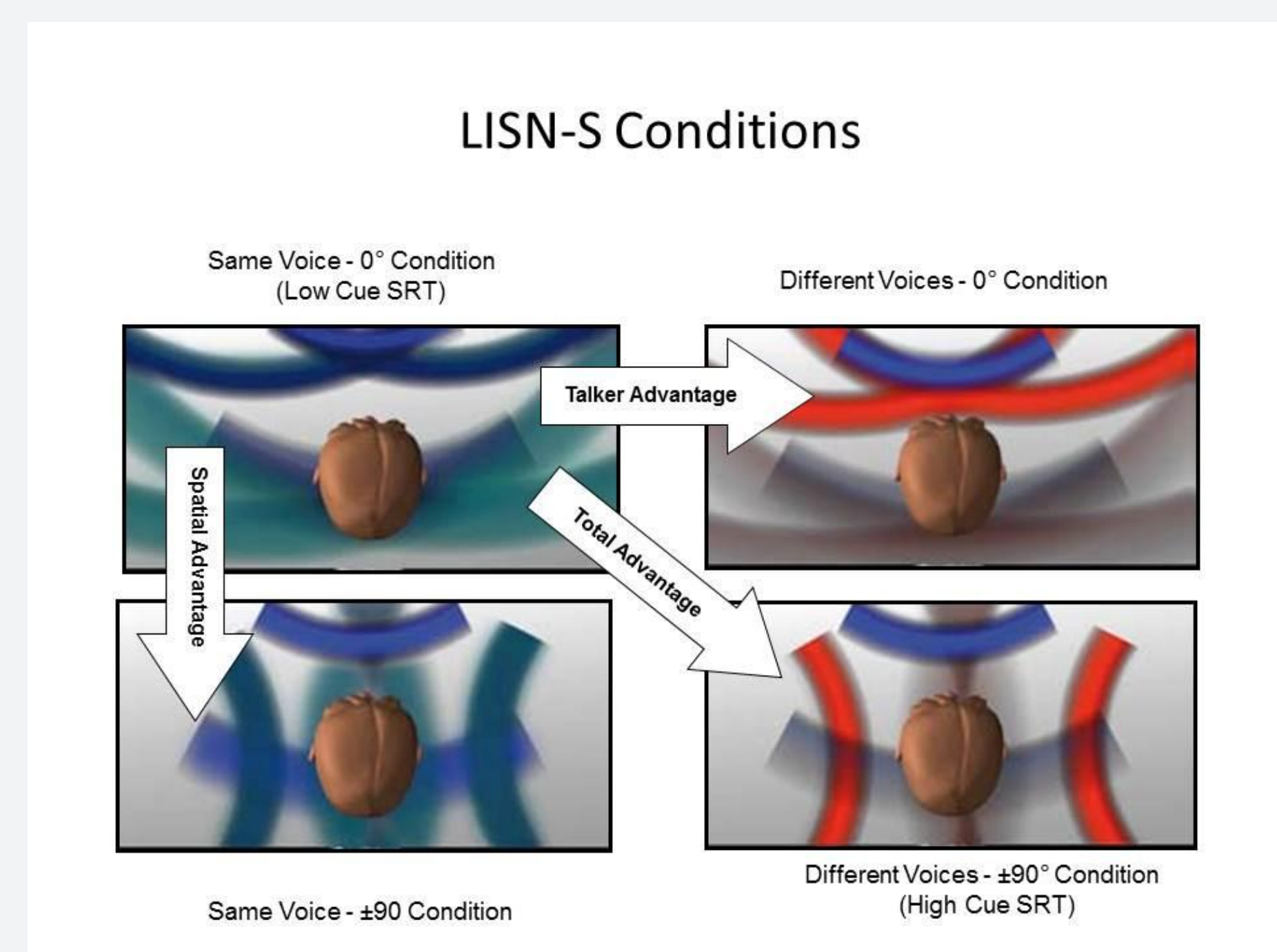


Figure 1- LiSN-S SRT and advantage measures

Preliminary Results for Aim 2

- The difference between individual participants' LiSN-S scores and the mean normative data scores for their age group are referred to as deficit scores.
- Preliminary results (n=54) show a significant correlation between 4FAHL and;
 - spatial advantage deficit ($r^2 = 0.72$, $p < 0.001$)
 - high cue deficit ($r^2 = 0.72$, $p < 0.001$)
 - total advantage deficit ($r^2 = 0.76$, $p < 0.001$)
 - low cue deficit ($r^2 = 0.30$, $p = 0.00016$)
- No correlation between 4FAHL and talker deficit ($p = 0.077$).
- No correlation between age and spatial deficit ($p = 0.23$).

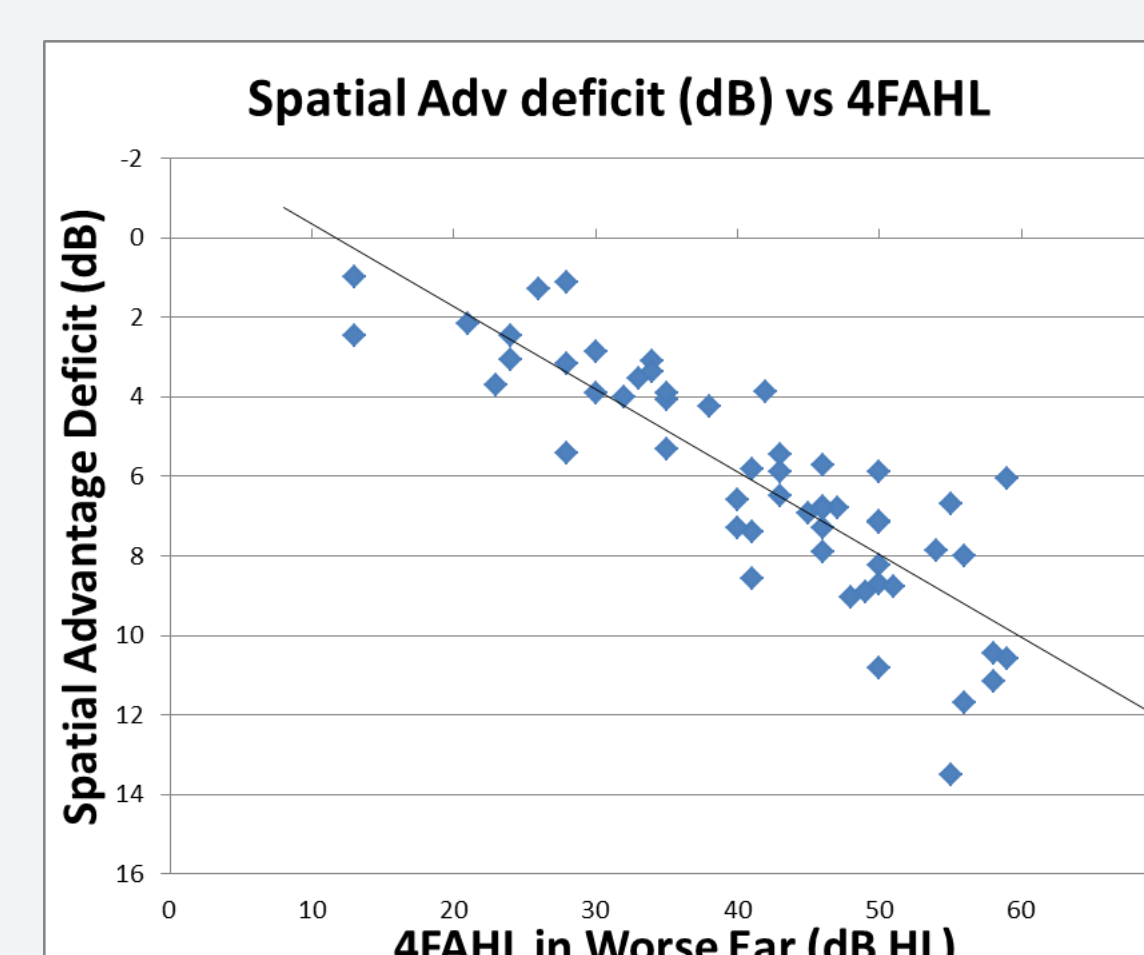


Figure 2- Scatterplot of spatial advantage deficit scores and FAHL in the worse ear.

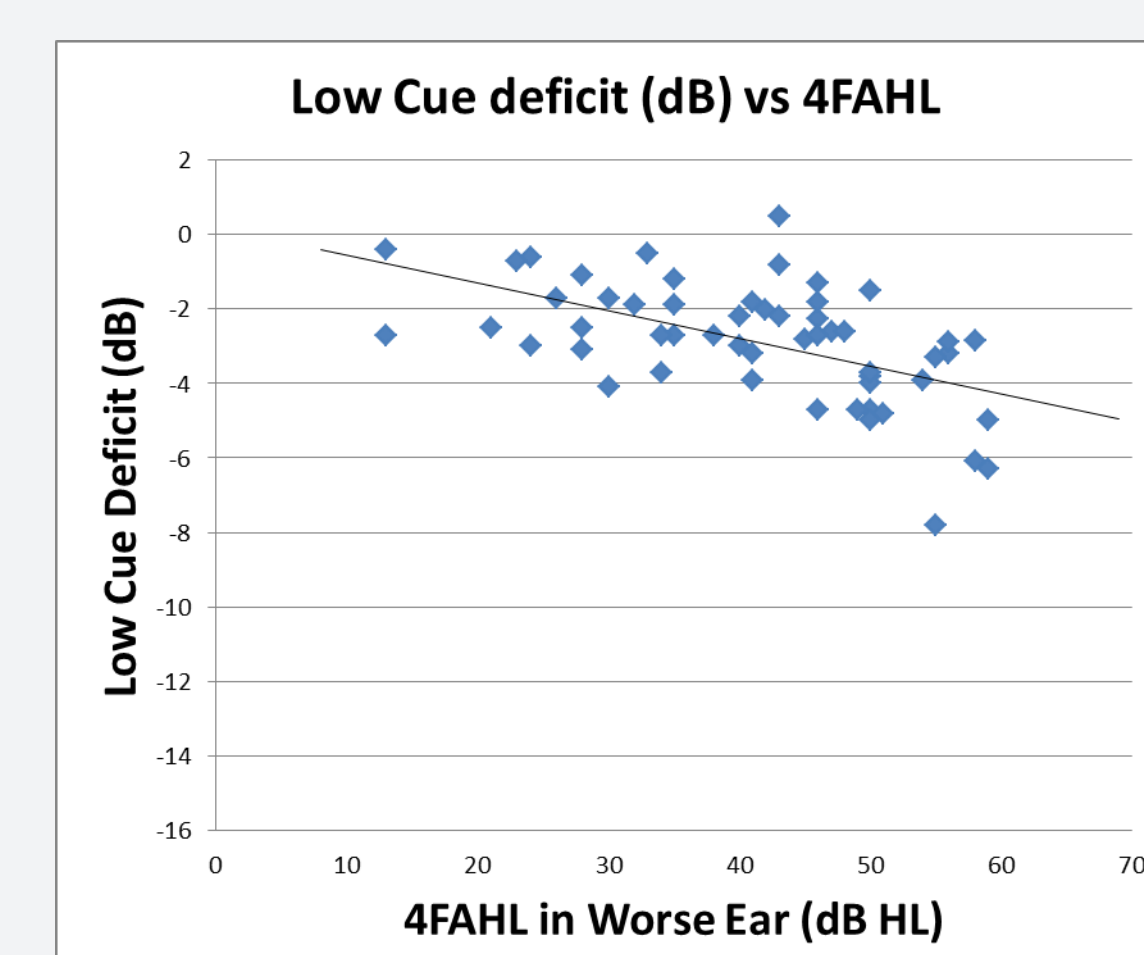


Figure 3- Scatterplot of low cue deficit scores and FAHL in the worse ear.

Preliminary Conclusions

- Greater hearing impairment is correlated with increased spatial processing difficulties.
- The stronger relationship between high cue deficit and 4FAHL than low cue deficit and 4FAHL supports the theory that SPD is a major cause of difficulty understanding speech in noise.
- Age does not effect spatial processing abilities in hearing impaired people.

Future Directions

- Can SPD in hearing impaired people be remediated using deficit-specific auditory training?
- Does cognitive ability effect spatial processing in hearing impaired people?
- Do spatial processing difficulties increase the likelihood of hearing aid rejection?

References

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Acknowledgements

Dinh Trinh, Jorge Mejia and Nicky Chong-White for their work developing the prescribed gain amplifier.

The authors acknowledge the financial support of the HEARing CRC, established and supported under the Australian Government's Cooperative Research Centres Program.