Listening in Spatialized Noise – Universal Test (LiSN-U)
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Aim
• To develop and evaluate a spatial listening test that is built upon the Listening in Spatialized Noise – Sentences Test (LiSN-S), but can be used with children and adults around the world for whom English is not their main language (including Indigenous Australians).
• The Listening in Spatialized Noise – Universal Test (LiSN-U) uses consonants and vowel (CV) pairs occurring with high frequency across most languages as the target and distractor stimuli.
• All stimuli were level normalized for equal intelligibility (n=20).

Test Stimuli and Administration
• Target = 30 CV tokens in pairs (e.g. /hi pu/) presented adaptively.
• Distractors = 2 x strings of 30 CV1-CV2-CV3-CV4 pseudo-words: (E.g. /ba di nu sa/) recorded in same voice (SV) as target CVs and presented at a constant level of 65 dB SPL.
• Test Conditions:
  1. SV90 – Target at 0°; Distracters at ± 90° azimuth
  2. SVo – Target and Distracters both at 0° azimuth
• Speech Reception Threshold (SRT) = signal-to-noise ratio (SNR) that yields 75% intelligibility. See Figure 1.
• Stopping criteria = estimated SE < 1 dB and ≥ 17 measured trials.
• Reporting: z-scores for SV90, SVo and spatial advantage (SA). SA is calculated in dB as SVo SRT - SV90 SRT.

Normative and Test-Retest Reliability Data
Participants – Test (n=150)
• 127 children (53;om – 123;om); 23 adults (19y;1m – 56y;3m)
Participants – Retest (n=132)
• 109 children (53;om – 123;om); 23 adults (19y;1m – 56y;3m)

Results
Gender: There were 76 females and 74 males. No effect of gender was identified for SV90, SVo or SA (p = 0.290 to 0.447).
Age: There was a significant effect of age on SV90, SVo SA score (dB) (p < 0.0001). See Figure 2.
Test-Retest Reliability: Mean changes in performance on retest on LiSN-U measures ranged from 0.4 dB to 1.3 dB. Reliability (r) ranged from 0.37 to 0.63. All correlations were significant (p < 0.00001).

Conclusions
The ability to understand LiSN-U phonemes presented in noise improves with age. Cut-off scores, calculated as 2 standard deviations below the mean adjusted for age, were calculated for each performance measure. These scores represent the level below which performance on LiSN-U is considered to be outside normal limits.

Future Research
To evaluate sensitivity of the LiSN-U, a study is currently in progress to compare LiSN-U and LiSN-S performance in children diagnosed with LiSN-S as having spatial processing disorder.

References:

LiSN-U vs LiSN-S
Analysis of LiSN-U data compared to previously published LiSN-S data reveals that from age 6;0 to 12;0 improvement on spatial advantage (SA) is approx 3.5 dB for both tests. SA is approx 6 dB bigger in LiSN-U than LiSN-S. Presumably this is because there are fewer differences between target and distractor in LiSN-U than in LiSN-S (and hence more informational masking). If so, this may make LiSN-U an even more sensitive detector of SPD than LiSN-S. See Figure 3.