On the factors affecting speech reception in a multi-talker listening scenario
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Introduction
- Hearing aids often report dissatisfaction when using aids in noisy scenarios.
- Audibility often implicated but only grossly accounted for.
- Need a tool that can control for audibility effects on a subject-by-subject basis while allowing natural cues for multi-talker source separation.
- Goal: Test ability of the Nonsense Syllable Response Measure (NSRM) to provide this capability by measuring speech performance in noisy scenario and correlating cognitive test results with difference between measured and predicted speech performance.

Methods
- **NSRM = “Ready NAME mark SYLLABLE now.”**
  - 8 names, 154 syllables, 12 talkers (6 male, 6 female)
  - NSRM well predicted using ANSI (2007) SII and proficiency P

Results (cont.)
- **Mean NH and individual HL audiograms**
  - Stepwise regression with residuals yielded:
    - $r = 0.45$ with TMA ($t(22)=2.35$, $p=0.014$)
    - $sr = 0.57$ with TMB ($t(23)=3.83$, $p<0.001$)
    - $sr = 0.00$ with age.
  - Age not correlated with residuals when TMA and TMB influence factored out.

Conclusions
- The NSRM corpus allows the combination of SII and proficiency measures to accurately predict noisy-scenario performance for many subjects.
- The difference between measured and predicted NSRM results can be used to investigate influence of non-audibility factors on noisy-scenario performance on a subject-by-subject basis.
- Current results consistent with hypothesis that processing speed and executive function are important non-audibility factors.
- The NSRM is a tool that can be used to control for audibility effects on a subject-by-subject basis while allowing natural cues for multi-talker source separation.

Side Note
- **SII with proficiency subsumes Plomp’s “SNR loss” model and is based on quiet-performance proficiency, not noise performance.**

Cognitive Results
- Scatterplots of the cognitive results and prediction residuals (predicted PC minus measured PC) indicate only BNJ HL results are significantly different from predicted performance

Current Test
- 10 NH and 16 HL subjects heard same stimuli in same order.
- Reverberant noisy scenario simulated using measured KEMAR impulse responses and noise recordings (see Fig. A).
- **NSRM syllable percent correct measured in:**
  - Quiet (Q) - one sentence from random loudspeaker, talker.
  - Background noise (BN) - same as Q but with quasi-diffuse SNR, 10 dB SNR.
  - Background noise plus jammer sentences (BNJ—Fig. B) - same as BN but with asynchronous NSRM sentences from other loudspeakers. Target indicated by NAME. All sentences same level.
  - Single NALR target gain used to shape all stimuli for all subjects.
  - Yielded single-sentence level of 87 dB SPL.