“Comparison of Two Speech-in-Noise Tests for Younger and Older Listeners”

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According to Kochkin (2002)…

- “Despite the many technological advances of the last decade, the ability to understand speech in background noise continues to be one of the biggest problems for hearing aid wearers.”

- In order for clinicians to use the technology in hearing aids to help with this difficulty, we must know how good an individual’s speech understanding in background noise really is.

So, what do we know?

- A person's audiogram does NOT tell us about his ability to understand speech in background noise.
- Certain hearing aid features are intended to help with the difficulty of background noise.
- Prior to fitting a hearing aid, a measure of speech understanding in background noise should be completed so that appropriate feature recommendations can be made.

SNR Loss…

- Refers to the increase in signal-to-noise ratio required by a listener to obtain 50% (SNR50) correct words, sentences, or words in sentences compared to normal performance

  - Normal performance is
    2 dB for the QSIN and 3 dB for the WIN

Two Speech-in-Noise Tests

- **QSIN**
  - Commercially available standardized test developed by Killion, Niquette, Gudmundesen, Revit, and Banerjee (2004)
- **WIN**
  - Clinically available standardized test developed by Wilson, Abrams, and Pillion (2003)

QSIN

-Words in sentences without carrier phrase

-Signal level held constant

-MIT female talker

-Four-talker babble

-Administered at 70dB SPL

-Measures SNR Loss

-Transduced through ER-3A insert earphones

WIN

-Monosyllabic words with carrier phrase

-Noise level held constant

-VA female talker

-Six-talker babble

-Administered at 80dB SPL

-Measures SNR Loss

-Transduced through ER-3A insert earphones

We want to know if it matters which of these two tests is used to evaluate speech understanding in background noise.

- Do the two tests provide different results for younger listeners?
- Do the two tests provide different results for older listeners?
- Do younger listeners perform better than older listeners, and if so, is the age differential equal for the two tests?

Issues…

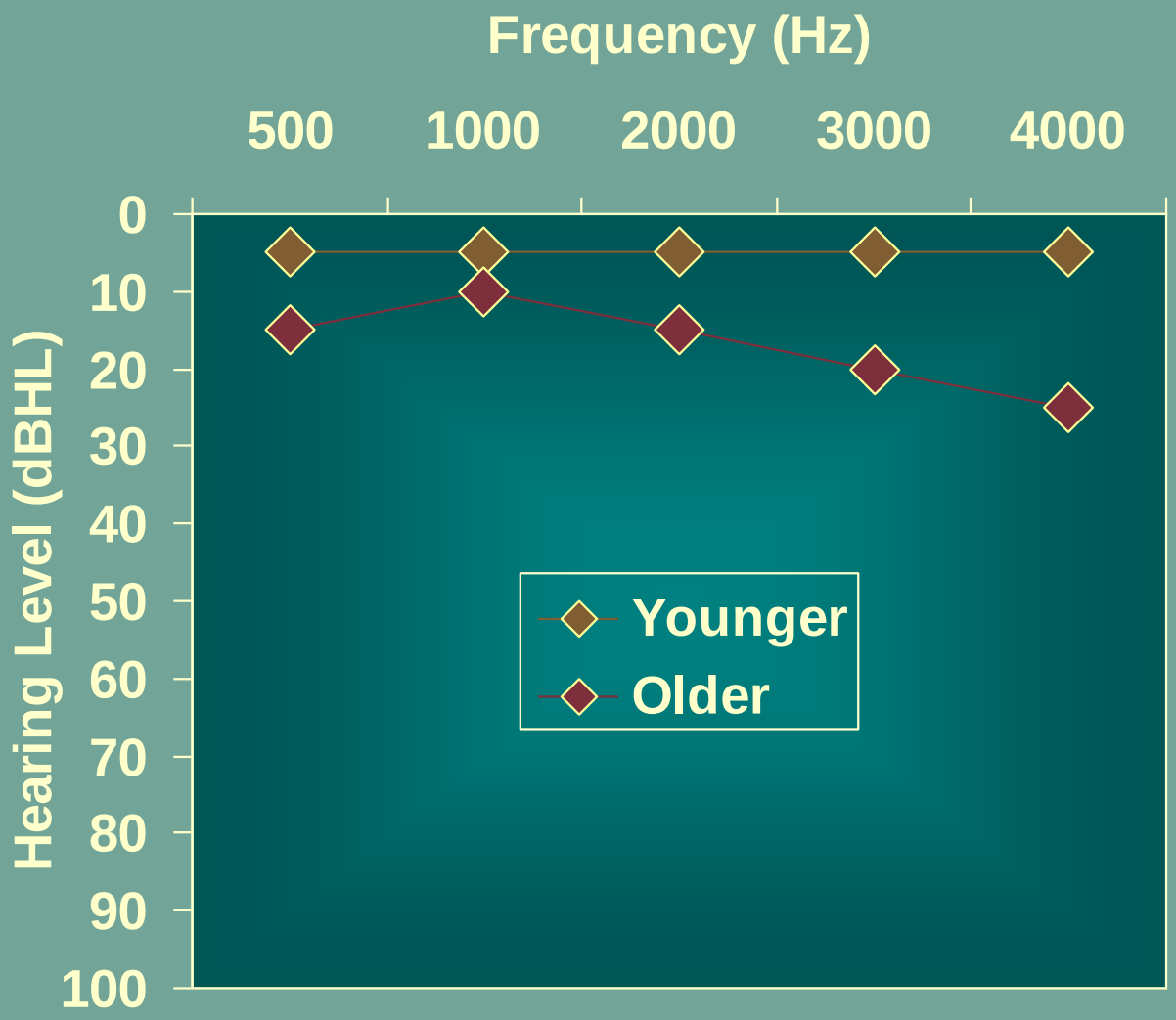
- It is generally agreed that when comparing performance on auditory speech tasks, audibility must be taken into consideration.

- It is also suggested that cognitive factors (e.g. auditory memory and processing speed) may impact performance on auditory speech tasks (sentences vs. words) as we age, even when audibility is the same, especially when background noise is a factor.

…Dealing with Issues

- Related to Audibility:
  - “Normal” hearing (thresholds ≤25 dB HL) was used as the inclusion criteria for the younger group.
  - “Age-Normal” hearing (based on the ISO thresholds by age) was used as the inclusion criteria for the older group. Thresholds ≤ the ISO median at each frequency were included.
- Related to Cognitive factors:
  - The Letter-Number Sequencing subtest of the WAIS III was used to verify differences in “cognition” based on age.

Subjects



15 Younger

-age 22-29
-11 female; 4 male
-mean LNS score: 15.87

15 Older

-age 60-72
-7 female; 8 male
-mean LNS score: 11.67

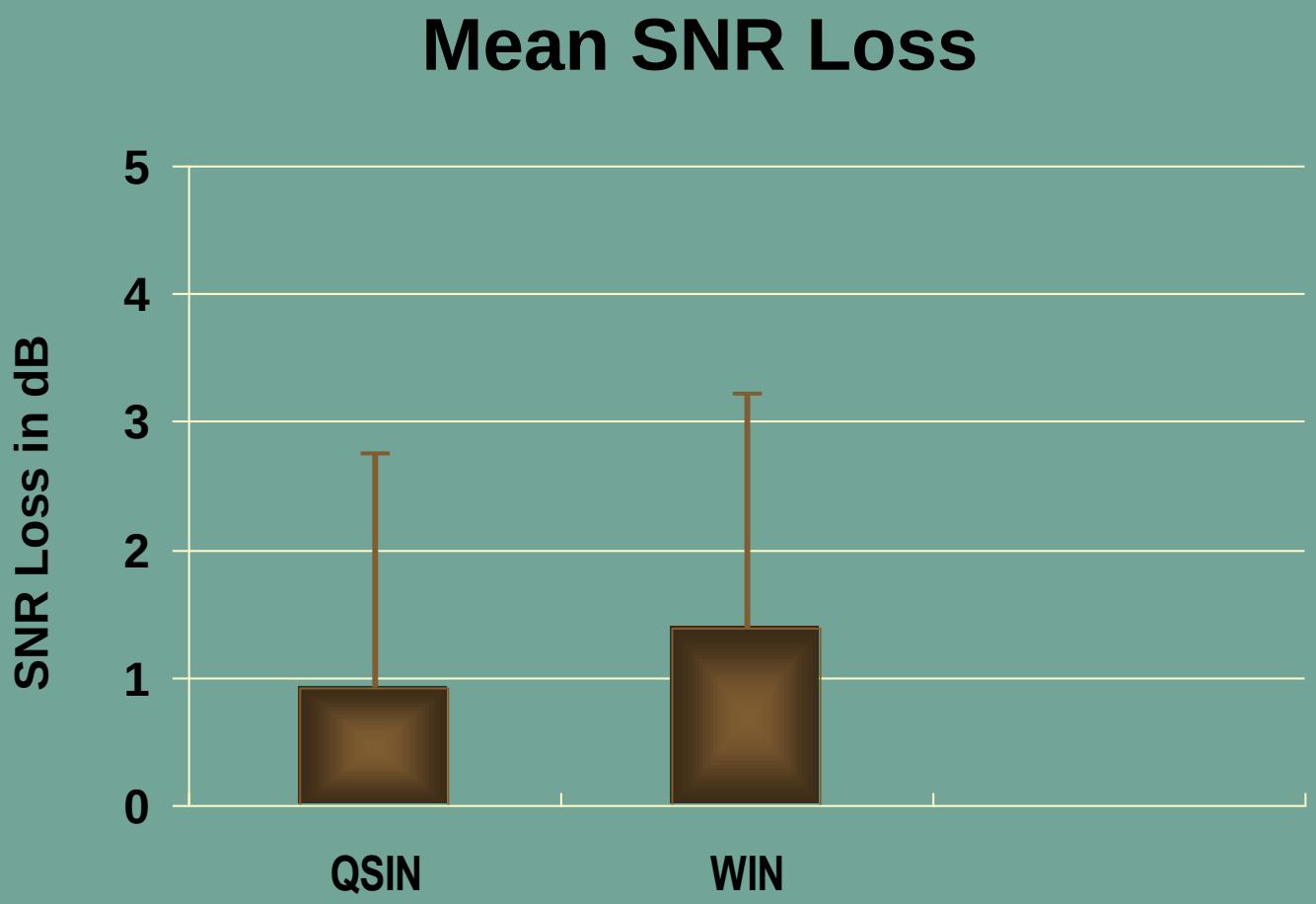
Procedure

- **QuickSIN**
  - Three lists randomly selected from 12 lists
  - Each list consists of 6 sentences with 5 target words per sentence
  - One sentence is presented at each signal to babble ratio (25, 20, 15,10, 5, and 0) per list
  - Total number of test words = 90
- **WIN**
  - Two lists utilized
  - Each list consists of 35 monosyllabic NU No. 6 words
  - One group of 5 words is presented at each signal to babble ratio (24, 20, 16, 12, 8, 4, and 0) per list
  - Total number of test words = 70

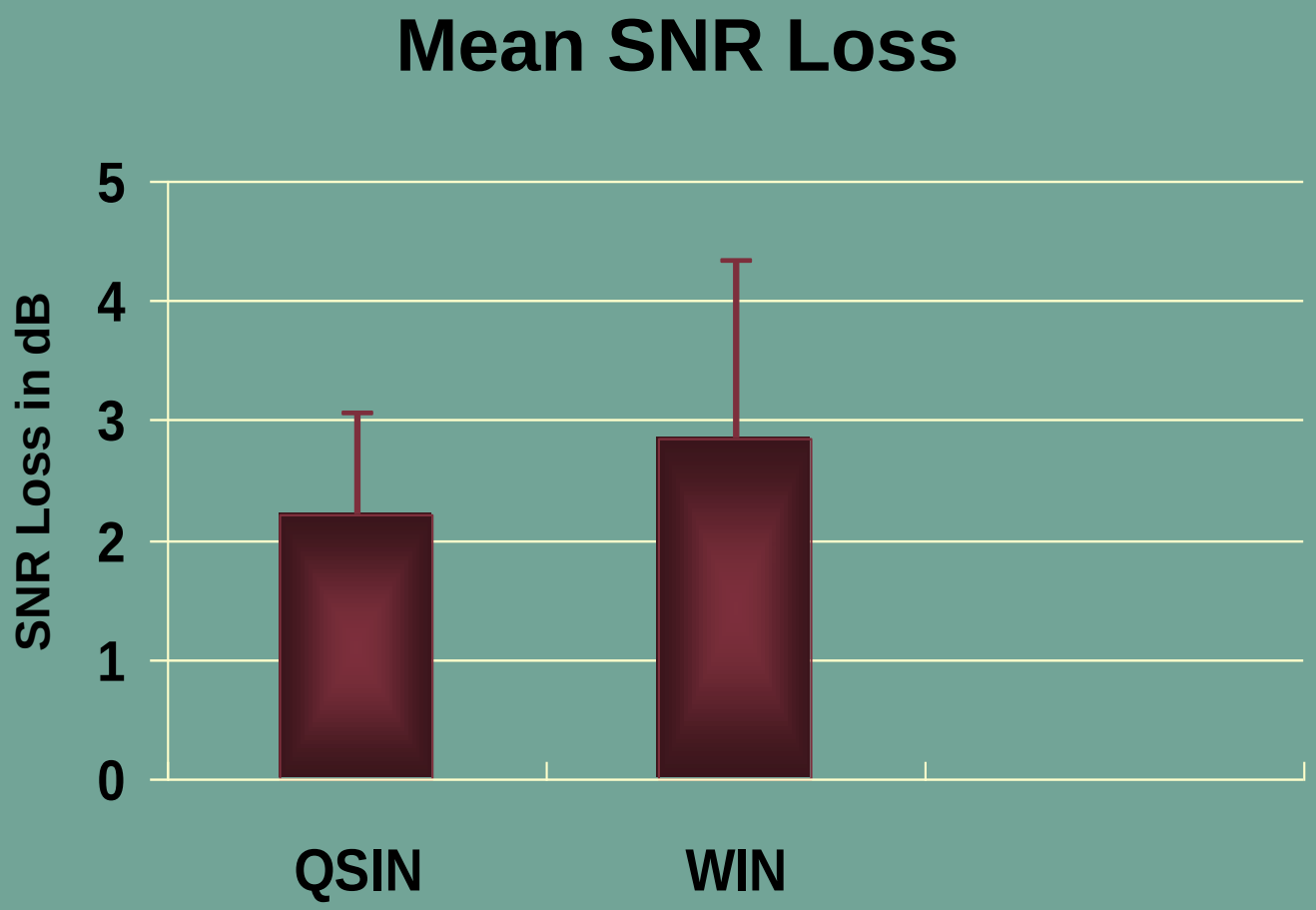
Results

- So, what do we know now?

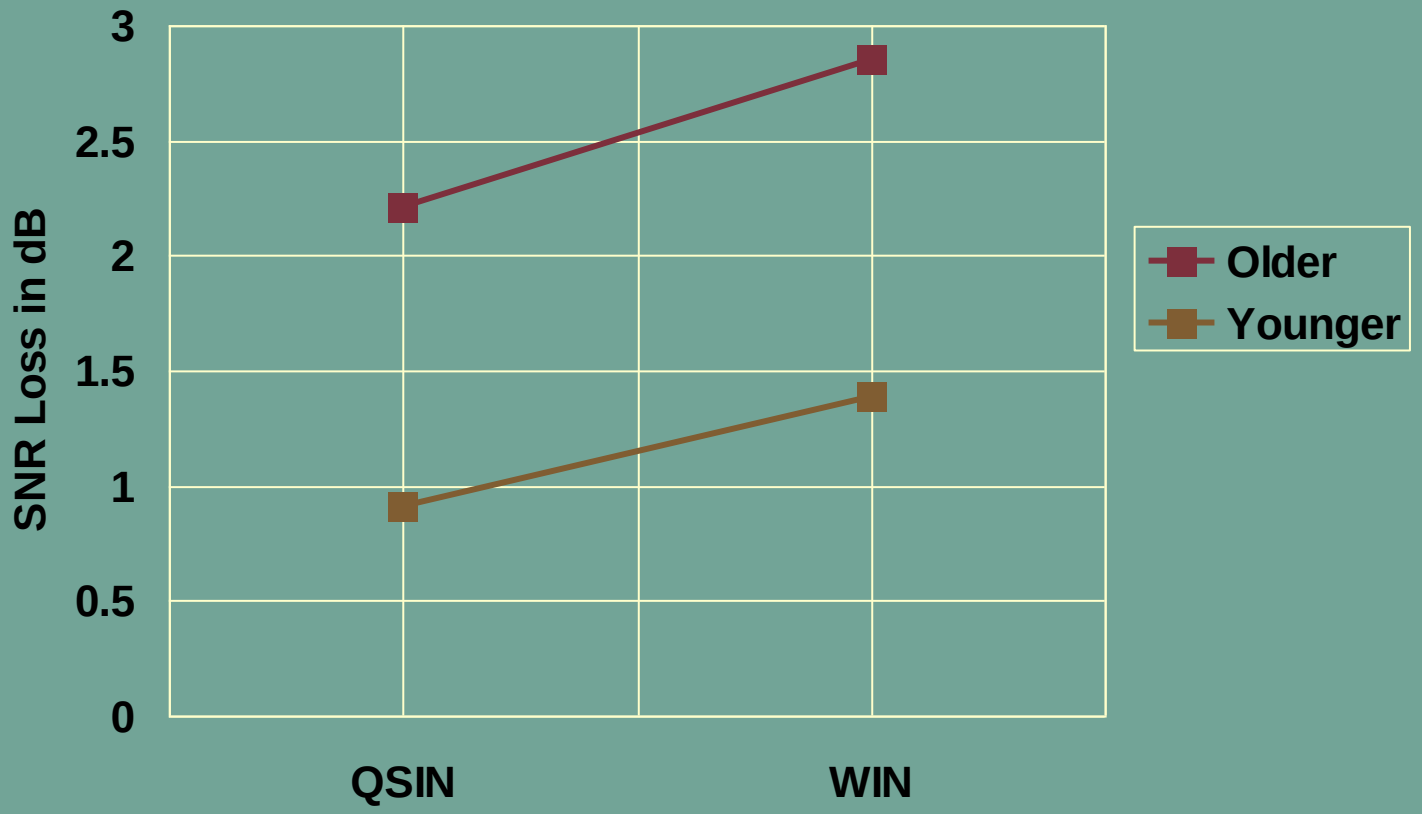
Do the two tests provide different results for younger listeners?



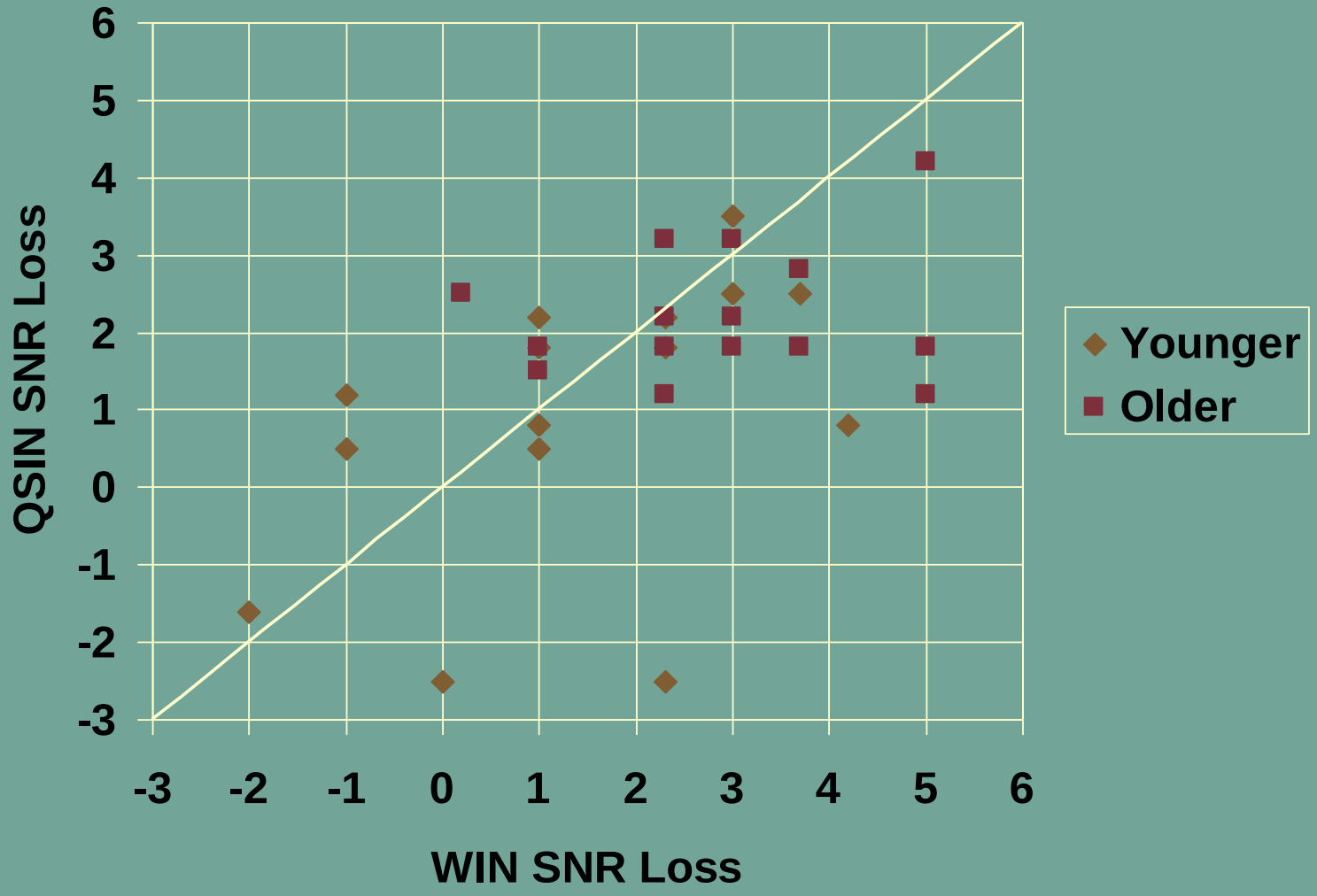
Do the two tests provide different results for older listeners?



Do younger listeners perform better than older listeners, and if so, is the age differential equal for the two tests?



Results of Both Tests for Each Subject



Practical Implications of What We Know Now

- In general, we can expect older individuals to perform more poorly than younger individuals on both of these measures of speech understanding ability in background noise. Older listeners typically achieve SNR Loss values which are 1.5 dB worse than those of younger listeners.
- The length of the stimulus (sentences vs. single words) and its possible dependence on cognitive factors that are impacted by aging does not seem to make the QuickSIN more difficult than the WIN for older listeners.
- Both the QuickSIN (3 lists) and the WIN (2 lists) can be administered and scored in ten minutes or less.
- Given that there is essentially no difference between the QSIN and the WIN as related to difficulty of administration or scoring, amount of time needed for administration, or in obtained results, it makes no difference which one you use with a hearing aid candidate in the age range of those included in this project.

Limitations Affecting What We Know

- Limited number of subjects
- Limited sample age, especially for the older group in that the “old old” is not represented

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Questions / Comments