Effect of Speech Perception Testing on Self-Reported State Anxiety  
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INTRODUCTION

- Anxiety in older adults has been shown to be associated with self-perceived hearing disability and handicap [4], as well as speech understanding in quiet [5] and in background noise [6].
- Middle-age and older adults with hearing loss are known to have deficits in speech understanding, especially in competitive listening environments (e.g., background noise, dichotic listening), etc. [7, 8].
- Dichotic speech recognition is known to induce increases in state anxiety for young adults with normal hearing [9]. Young adults with normal hearing, however, do not constitute a clinical population.
- The impact of clinical speech recognition testing (e.g., speech-in-noise and dichotic listening) on levels of state anxiety has not been considered in a clinical audiological population.
- The purpose of the present study was to assess individual state anxiety as a function of speech recognition testing using three clinical measures of speech in noise and one clinical measure of dichotic speech recognition among middle-aged and older adults.

METHODS

Participants
- 85 adults were recruited to participate in 3 age groups:
  - Group 1: Young Adults (n = 30) (Female, 5 males)  
    - Age: 30-44 years  
    - Normal hearing  
    - No more than a mild high-frequency sensorineural hearing loss.
  - Group 2: Middle-Aged Adults (n = 25) (Female, 12 males)  
    - Age: 45-64 years  
    - Normal hearing  
    - No more than a moderately-severe high-frequency sensorineural hearing loss.
  - Group 3: Older Adults (n = 30) (Female, 6 males)  
    - Age: 65-86 years  
    - Normal hearing  
    - No more than a moderately high-frequency sensorineural hearing loss.

Inclusion Criteria
- (1) Normal otoscopy and tympanometry;
- (2) Right-handedness [10];
- (3) Native speakers of English;
- (4) Normal cognitive status for the older adult group (MMSE ≥ 26) [11].

MATERIALS
- Speech Recognition Measures:  
  - Revised Speech Perception in Noise (R-SPIN) test [12];
  - Quick Speech in Noise (QSIN) test [13];
  - Words-In-Noise (WIN) test [14];
  - Dichotic Digits Test (DDT) [15];
- State Anxiety: State Trait Anxiety Inventory (Form Y) [16].

PROCEDURES
- State anxiety was measured prior to speech recognition (e.g., baseline) and after each speech recognition measure (e.g., post-test) for a total of four measures;
- The order of speech recognition tests was counterbalanced across subjects;
- Presentation level was via insert earphones:  

SPEECH RECOGNITION PERFORMANCE

STATE ANXIETY: GROUP DATA

STATE ANXIETY: INDIVIDUAL DATA

DISCUSSION & CONCLUSIONS

Speech Recognition Performance
- Average speech recognition performance was as expected: older adults performed significantly poorer than young adults and middle-aged adults for the R-SPIN, QSIN, and WIN, and significantly poorer than young adults for the DDT.

State Anxiety and Speech Recognition Performance
- No significant differences in state anxiety were observed between groups at baseline.
- On average, all groups exhibited increases in state anxiety after each speech recognition measure (Figures 8-10).
- Middle-aged adults exhibited significantly greater increases in state anxiety (re: STAI difference scores, Figure 10) as compared to young and older adults.
- Differences in state anxiety across speech recognition testing were not observed for young and older adult groups.

Conclusions
- Results suggest that speech recognition testing (e.g., speech-in-noise and dichotic listening) impacts the state of the population, even when presented as an average.
- This was particularly evident for the middle-aged adults.
- Higher levels of anxiety induced by speech recognition testing in middle-aged adults may reflect more generalized anxiety related to midlife [16].
- Despite mild to moderately-severe degrees of hearing loss, the older adult listeners exhibited little increase in state anxiety as a function of speech recognition testing, perhaps related to a greater acceptance of age-related hearing impairment and speech understanding deficits.
- A small percentage of participants (3-13%) responded “yes” to the question “Does anxiety cause you to avoid social situations with background noise?” Awareness of the patient’s state anxiety, therefore, may be beneficial for patient comfort during diagnostic testing and for counseling purposes (i.e., communication strategies).

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REFERENCES

Table 1. Percentage of subjects answering yes or no to the question “Does anxiety cause you to avoid social situations with background noise, or difficult listening situations?”

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young Adults</td>
<td>97%</td>
<td>3%</td>
<td>1) Noise is annoying when anxious</td>
</tr>
<tr>
<td>Middle-Aged Adults</td>
<td>87%</td>
<td>13%</td>
<td>1) Difficulty separating speech from background noise; 2) Greater anxiety with more important events</td>
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<tr>
<td>Older Adults</td>
<td>88%</td>
<td>12%</td>
<td>1) Avoids restaurants/crowds; 2) Difficulty with &gt;5 people; 3) Difficulty when concentrating on speakers</td>
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