



Test-Retest Reliability of the Word Auditory Recognition Recall Measure (WARRM) in Older Individuals with Hearing Loss

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INTRODUCTION

Working memory (WM) is one of the multiple cognitive processes involved in temporary storage of information and the use of that information to perform various cognitive tasks (e.g., speech understanding). WM varies in capacity between and within individuals. Recent studies have suggested measuring WM will further assess speech understanding abilities in listeners with hearing loss (e.g., Pichora-Fuller, 2007). Many current WM measures are presented in the visual modality which allows for inter-individual differences in WM to be compared between listeners, but few exist in the auditory modality, which allows intra-individual differences in WM to be compared within a given listener under varying listening conditions. The Word Auditory Recognition and Recall Measure (WARRM; Smith et al., 2016) was developed in the auditory modality to measure inter- and intra-individual differences in auditory WM for speech. Before the WARRM can be used clinically, the psychometric properties, including test-retest reliability, must be established.

PURPOSE

The study purposes were to determine:

1. Intra-session test-retest reliability of the WARRM
 - could reveal a practice effect
2. Inter-session test-retest reliability
 - determine if WARRM is stable over time
 - consideration as outcome measure

METHODS

Participants

- 48 older adults with hearing loss
 - 47 male, 1 female
 - Mean age = 70.4 years, SD = 4.0
 - >21 on the Montreal Cognitive Assessment (MoCA; Nasreddine et al., 2005)

METHODS

Word Auditory Recognition and Recall Measure (WARRM; Smith et al., 2016).

- Follows the Reading Span test paradigm of Daneman and Carpenter (1980)
- 100 audio-recorded monosyllabic words distributed across recall set sizes of 2, 3, 4, 5, and 6 words, with 5 trials for each set size
- Listener does the following after each word in a given trial:
 - **Recognition:** Target word presented, and asked to repeat (calculated in percent correct score)
 - **Judgement:** Performs judgement task related to target word (adds cognitive processing of word)
 - Word begins with letter from the first half (A-M) or second half (N-Z) of the alphabet
- After a given trial, the listener is prompted to:
 - **Recall:** Repeats all target words in the trial in order (scored as a partial span score or percent correct score)

Procedures

- Testing was completed over 2 sessions, minimum of 2 weeks apart
- **Session 1**
 - Pure-tone thresholds tested for octave frequencies .25-8.0 kHz and inter-octave frequencies 3.0 and 6.0 kHz
 - MoCA administered
 - Word recognition testing in quiet, 80 dB HL, binaurally
 - Two randomizations of the WARRM (WARRM 1 and WARRM 2) administered binaurally via insert earphones at 80 dB HL
- **Session 2**
 - One randomization of the WARRM (WARRM 3) was administered
- Randomizations of WARRM lists were counterbalanced across participants and sessions

RESULTS

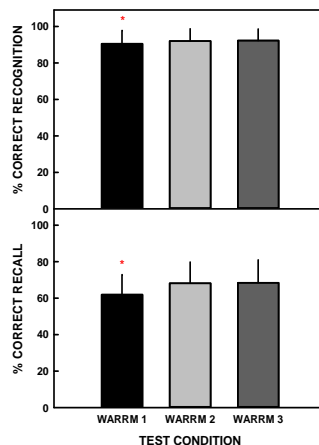


Figure 1. Mean recognition and recall performance (percent correct) is plotted for each test condition. Error bars represent one standard deviation. * = significant difference

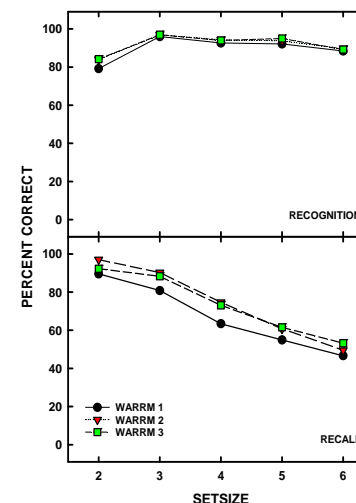


Figure 2. Mean recognition and recall performance (percent correct) is plotted as a function of setsize for each test condition.

Table 1. Test-retest reliability for recall scored in partial span and percent correct across sessions was calculated by using intra-class correlation coefficients from a two-way random effects model of consistency.

| | Partial Span | | Percent Correct | |
|---------------------|--------------|-----------|-----------------|-----------|
| | ICC | 95% CI | ICC | 95% CI |
| WARRM 1 vs. WARRM 2 | 0.71 | 0.53-0.83 | 0.81 | 0.68-0.89 |
| WARRM 1 vs. WARRM 3 | 0.60 | 0.38-0.75 | 0.80 | 0.66-0.88 |
| WARRM 2 vs. WARRM 3 | 0.83 | 0.71-0.90 | 0.88 | 0.80-0.93 |

ICC = intra-class correlation coefficient; CI = confidence interval

SUMMARY/CONCLUSIONS

- WARRM 1 recognition and recall scores were significantly poorer than WARRMs 2 and 3, which were similar (Figure 1)
 - suggests practice or learning effects
 - WARRM could incorporate more difficult practice to allow the individual to develop memory strategies. Examples could include:
 - Higher set sizes (current WARRM uses 2 trials of set size 2 for practice)
 - Administration of entire WARRM for practice (until partial span achieved)
- High intra-class correlation coefficients show good inter- and intra- test-retest reliability of the WARRM (Table1)
 - When scored percent correct for recall and partial span score for WARRM 2 vs. WARRM 3 conditions

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