INTRODUCTION

• An emerging literature that suggest speech sound categories are dynamic representations that continuously update with habitually encountered speech sound information throughout the lifespan (e.g. Kraljcic & Samuel, 2005).

• Differences in the way in which we update speech information may be tied to certain aspects of reading:
  - Decoding ability, along with word recognition via orthographic-semantic mapping, are two major aspects to various models of reading (Coltheart, 2006; Seidenberg, 2005).
  - Decoding ability is particularly associated with phonological processing ability, thought to reflect, at least in part, the quality of speech representations (e.g. Torgesen, Wagner, & Rashotte, 1994).

• Thus, it stands to reason that processes of learning new speech sounds are essential to decoding ability.

• Prior work suggests that off-line memory consolidation during sleep may be particularly important for building abstract speech sound representations (Earle & Myers, 2015; Fenn, Nusbaum, Margolash, 2013).

• Individual differences in the offline consolidation of speech information may lead to differences in the quality of speech sound representations, which may in turn influence phonological processing ability (Earle & Arthur, 2017).

Do the habitual memory processes that are involved in updating phonological categories predict reading ability in adults?

We predicted that individual differences in offline consolidation of speech sound information will be predictive of differences in nonword reading (which relies on decoding) ability, but not differences in word reading, which may be accomplished through orthographic-semantic mapping.

MATERIALS & METHODS

Participants

Induced auditory and orthographic criteria for participants within this data set included:

- Monophonic English speaker
- Between the ages of 18 and 24 years old
- No history of neurological disorders or socio-emotional, attention, or cognitive disorder, per self-report
- No use of prescription medication known to effect sleep, per self-report

Procedure

• Sessions 1 & 2: Speech-Sound Training
  - Participants were trained to match a sound with a trained speaker in the form of minimal pair contrast.
  - To determine if object sound contrasted with “word” through 200 feedback trials.
  - Post-training testing was completed immediately after the form of identification and discrimination tasks.

• Session 3: Discrimination test
  - Token was cut from the form of discrimination.

Speech Sound Training and Assessment

There were two (2) primary tasks completed prior to training that related to the speech sounds noted above. This includes an identification task and a discrimination task.

• Identification
  - Participants were presented with a non-real object that they were trained to match with a specific speech sound. Though 200 feedback trials, during the testing phase (Day 1: post training & Day 2), participants were asked to select the object associated with the sound presented (15 trials).

• Discrimination
  - Participants were presented with two tokens concomitantly with a 1-second inter-stimuli interval. They were then asked to determine if these sounds were the same or different. Participants completed 64 trials both days.

RESULTS

• Data transformations:
  - Discrimination and identification proportions accuracy were transformed into d-scores to account for potential response bias
  - Post-training d’ scores for discrimination and identification were scaled using the proximity-to-maximum scaling method, then averaged, to arrive at single post-training perceptual scores immediately after training, and again after 12 hours
  - Raw scores on the word-level reading subtests (Word Identification and word attack of the WRMT-III; Single word efficiency and phonemic decoding of the TOWRE-II) were scaled using the proximity to maximum scaling method, then averaged across time and untimed conditions, to come up with a single scores for “word” and “nonword” reading abilities

• The initial set of correlations looked at were to determine if correlation between perceptual ability at any time during testing could predict reading ability.

CONCLUSION

• Results show that overnight consolidation of speech sounds, beyond initial learning, may be predictive of decoding abilities (but not real word reading) in adults.

• This finding is consistent with the claim that speech sound representations continue to be updated throughout the lifespan.

• Moreover, subtle differences in the memory processes by which speech sound representations are updated may contribute to variability in higher-order language skills such as reading.

• This finding furthermore raises interesting questions about the potential for problems with memory consolidation in developmental dyslexia, and the importance of sleep hygiene for optimal language and reading function.

REFERENCES


