**Introduction**

- Whether or not cluttering is a speech fluency disorder with a language component or is a separate language disorder remains debated.
- Cluttering may be a motor speech disorder especially considering some of the major characteristics such as rate deviations, excessive coarticulation, and abnormal pauses (Ward, 2011).
- It has been suggested that speech errors in cluttering arise because of lack of planning or formulation time, possibly related to phonological encoding (Van Zaalen, Wijnen, & Dejonckere, 2009).
- Stutterers have been shown to be slower on a phoneme monitoring task, suggesting pre-articulatory problems at the level of phonological encoding (Sasisekaran et al., 2006).

**Purpose of study:** to determine whether clutterers’ phonological manipulation abilities are different than that of controls and of stutterers.

- If clutterers’ speech output pattern reflects their phonological encoding abilities, they may be faster and more error-prone on a task that taps into this level of processing, viz., self-monitoring for speech sounds (phonemes) in inner/covert speech.
- However, if the internal monitoring step is absent, or impaired, in clutterers, there is no reason to expect faster times when they are forced to deliberately monitor the internal speech plan in an experimental task.

**Methods**

**Participants**
- Participants (see Table 1) completed the Self-Awareness of Speech Index (St. Louis & Adams, 2005) and Predictive Cluttering Inventory (Daly, 2006).
- Control participants had no speech, language, or hearing deficits.
- One participant, diagnosed with both cluttering and stuttering, has been included in graphs for comparison, but was excluded from statistical analyses.

**Pre-tests**
- Participants first completed subtests from the Psycholinguistics Assessments of Language Processing in Aphasia (PALPA, 1992).
- Auditory Repetition of Words and Nonwords (9), Rhyme Judgment requires Picture Selection (14), Word Rhyme Judgment (15), Phonological Segmentation of Initial Sounds (16), Phonological Segmentation of Final Sounds (17), and Picture Naming (53).

**Phoneme Monitoring**
- Tasks were a partial replication of Sasisekaran et al., (2006).
- Participants monitored for the presence or absence of a target phoneme (consonant + schwa, e.g. /ba/) during silent picture naming.
- Participants were familiarized with the words and required to name them correctly prior to the experiment.
- 28 bimoraic words were used, with the target phoneme occurring in one of four positions, C/VC.CV/CV (e.g. “p*ig*pet”).
- Phonemes to monitor: /p/, /t/, /k/, /d/, /g/, /s/, /z/, /θ/, /j/, /n/, /m/, /l/, which were balanced among position within the words.

**Results**

- An auditory monitoring task was developed to closely approximate the phoneme monitoring task.
- Participants monitored for one of four tones (500Hz, 1000Hz, 2000Hz, or 2500Hz) among a sequence of four tones (same frequencies with addition of 1500Hz as a possibility) using a similar procedure as in the phoneme detection task.
- Allowed general auditory monitoring skills to be assessed, which does not involve any phonological or lexical processing.

**Simple Motor Task**
- Participants pressed the spacebar as soon as a tone was presented, with a random interstimulus interval of either 200ms, 500ms, 1000ms, or 1500ms.
- Allowed us to rule out any basic motor response differences between groups.

**Discussion and Conclusions**

- The present study replicated the findings of Sasisekaran et al. (2006) by St. Louis (indicating that stutterers have slower reaction times than controls during phoneme monitoring, but not auditory monitoring or a simple motor task).
- Contrary to Sasisekaran et al. (2006) the stutterers in this study did not make significantly more errors than the controls during both tasks.
- Clutterers made numerically more errors than controls during the phoneme and complex auditory monitoring task — nearly the same number as stutterers.
- Under the assumption that the present study is low on power, we therefore suggest phonological encoding is disrupted in clutterers, leading to errors in the speech plan.
- To that extent, the errors in cluttering may be generated during phonological encoding, just like stuttering errors as accounted for by the Covert Repair Hypothesis (CRH, Postma & Kolk, 1993). In contrast to what the CRH says about stuttering disfluencies being side effects of internal error repairs (hypermotoring), we propose that in clutterers, internal monitoring of the prearticulatory speech plan may be disrupted (hypermotoring), in addition to the phonological encoding deficit.
- These two deficits in the clutterer’s system allow the errors to advance to the final phonological output, while the absence of time-consuming internal monitoring accounts for the increased speech rate in cluttering.
- While not of primary interest in this study, clutterers’ relatively poor performance on the nonword repetition task in the PALPA suggests further research in this area is warranted.
- PALPA results for all 3 experimental groups for segmentation and rhyme judgment may also warrant further research on these tasks.
- It is also suggested that the findings of this study with some caution due to low participant numbers.
- This ongoing study aims to increase power by continuing recruitment.