Linguistic Approaches to Autism and Neurodevelopmental Disorders
What is Fluency?

- Fluency/Disfluency describes the skill with which an individual produces forward flowing speech.
- Fluency/Disfluency can be viewed as a continuum which varies greatly across time and settings.

Speakers are fluent in their speech production if they produce normally long strings of sounds at a normally rapid rate without pausing or hesitation, and with a normal absence of effort. Starkweather, 1987
Disfluencies

On-line strategies to self-repair perceived errors

- System self-monitors for errors and appropriateness
- Level of monitoring is context dependent
- When detected errors are sufficiently alarming, the speaker stops and revises the sound, syllable, word, or phrase

Strategies to gain extra time during speech planning and execution

- System stalls by re-executing a previous unit
- Allows time for “catching-up”
- Disfluency type hints to the nature of the deficit
Disfluencies

Breakdown in the linguistic plan

The individual struggles with organizing and formulating what they want to say

- Phrase Repetitions – Conceptualization/syntactic complexity
- Whole Word Repetitions - Word finding
- Part Word Repetitions – Phonological
- Pauses & Interjections – Processing difficulties
- Abandoned Words/Phrases – Topic maintenance

Breakdown in the timing or sequencing of the motor plan

- The individual knows what they want to say but motor plan is lacking
- Results in sound/syllable repetitions, prolongations & blocks
What is Stuttering?

Stuttering is a neurologically based disorder which impairs an individual’s ability to time and sequence the underlying movements necessary for speech.

This often results in:

- The characteristic stuttering behaviors
- A lack of confidence in one’s ability to effectively communicate and a sense of “losing control”
- The individual employing increased tension, struggle or pushing to try to force the words out
- The anticipation of future speech breakdowns causing the individual to avoid talking, switch words or do anything to hide the overt behaviors
## Typical Disfluencies

<table>
<thead>
<tr>
<th>Type of Behavior</th>
<th>Stuttering</th>
<th>Atypical Disfluencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole-word &amp; phrase repetitions</td>
<td>Whole &amp; part word repetitions</td>
<td>Whole or part word repetitions</td>
</tr>
<tr>
<td>Sentence Revisions</td>
<td>Prolongations</td>
<td>Sound prolongations</td>
</tr>
<tr>
<td>Interjections/Fillers</td>
<td>Blocks</td>
<td>Sound insertions</td>
</tr>
</tbody>
</table>

## Location of Behavior

<table>
<thead>
<tr>
<th>Type of Behavior</th>
<th>Stuttering</th>
<th>Atypical Disfluencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primarily between words</td>
<td>Within words</td>
<td>Medial and/or final position</td>
</tr>
<tr>
<td>Typically initial position</td>
<td>Tendency to cluster</td>
<td></td>
</tr>
</tbody>
</table>

## Frequency

<table>
<thead>
<tr>
<th>Type of Behavior</th>
<th>Stuttering</th>
<th>Atypical Disfluencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 10% of Syllables</td>
<td>&gt; 4% of syll.</td>
<td>?</td>
</tr>
<tr>
<td>2x as disfluent</td>
<td>Noticed &gt;10%</td>
<td>?</td>
</tr>
</tbody>
</table>

## Duration

<table>
<thead>
<tr>
<th>Type of Behavior</th>
<th>Stuttering</th>
<th>Atypical Disfluencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2 Repetitions</td>
<td>3 &lt; Repetitions</td>
<td>?</td>
</tr>
<tr>
<td>Truncated pauses between repetitions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Reactions

<table>
<thead>
<tr>
<th>Type of Behavior</th>
<th>Stuttering</th>
<th>Atypical Disfluencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typically no reactions &amp; minimal awareness</td>
<td>Secondary behaviors Avoidances Fears/Anxiety</td>
<td>Typically no reactions &amp; minimal awareness</td>
</tr>
</tbody>
</table>
Case reports and case series have suggested a higher prevalence of disfluencies in individuals with ASD. These include:

- Typical disfluencies
- Stuttering-like disfluencies
- Atypical disfluencies

(Lake et al., 2011; Scott et al., 2013; Shriberg et al., 2001; Scott et al., 2006; Sisskin, 2006)
Why study disfluency and ASD?

Social communication is a core deficit of ASD

Disfluent speech can affect social communication

Identifying disfluency patterns could lead towards specialized social communication treatment plans
<table>
<thead>
<tr>
<th>Study</th>
<th>Authors</th>
<th>Year</th>
<th>Pop</th>
<th>Finding</th>
</tr>
</thead>
</table>
| Speech and prosody characteristics of adolescents and adults with high-functioning autism and Asperger syndrome | Shriberg, Paul, McSweeney, Klin, Cohen & Volkmar | 2001 | 15 HFA 15 AS 53 CG | • CG > fluent than HFA & AS  
• HFA > PWR, WR, REV than CG  
• AS > PWR than CG |
| Brief Report: Relations between prosody performance and communication and socialization ratings in high functioning speakers with autism spectrum disorders | Paul, Shriberg, Mcsweeney, Cicchetti, Klin, & Volkmar | 2005 | (Same as Above) | Phrasing errors do not appear to have any significant effect on listeners’ judgments of their social/communication skill (Vineland) |
| Listener vs. speaker oriented aspects of speech: studying the disfluencies of individuals with autism spectrum disorders | Lake, Humphreys, & Cardy                     | 2011 | 13 ASD 13 TDP | • ASD < Filled pauses than TDP  
• ASD > Silent pauses than TDP  
• ASD < Rev than TDP  
• ASD > Rep than TDP |
| Preliminary study of disfluency in school-aged children with autism | Scaler Scott, Tetnowski, Flaitz, & Yaruss    | 2014 | 11 AS 11 CWS 11 TDP | • No diff in TWD  
• No diff in % NSD  
• CWS > SLD than AS  
• AS > SLD than TDP  
• No differences in WFD |
Mutual Questions

Can the disfluencies distinguish children with ASD from typically developing peers?

Do disfluency rates/types correlate with parent/clinician measures of social impairment?

Poster Title: "Disfluencies Distinguish the Speech of Children with Autism Spectrum Disorder"
Authors: Meghan Santulli, Julia Parish-Morris, Emily F. Ferguson, Leila Bateman, Robert T. Schultz, Joseph G. Donaher
Session date/time: Friday, May 13, 2016, 5:30 PM - 7:30 PM
Baltimore Convention Center, Hall A.
Certain Disfluencies Distinguish the Speech of Children with ASD

79 Children aged 6-17
Categorized into three groups:
- ASD – N/45
- Non-ASD (mixed clinical) N/17
- Typical Dev. Children N/17

Data from previously recorded clinical evaluations
ADOS (Module 3-expressive language skills with range of sentence types and grammatical forms)
Results: Disfluency

No significant differences in TDL

Unique patterns of disfluencies

ASD produced significantly more Stuttering-Like Disfluencies than Non-ASD & TDC

ASD produced significantly more Atypical Disfluencies than Non-ASD & TDC

TDC & Non-ASD did not differ on any disfluency measure
Results: Clinical Measures

Social Impairment: 

- Parent Report - SRS
- Clinician Report - ADOS

For ASD group TDL, SL, NSL, AD correlated with ADOS score but not with SRS.

For TDC higher SL disfluency rates associated with more negative SRS scores.

For Non-ASD disfluency rates did not correlate with ADOS or SRS scores.
Future Directions

- Future research could shed light on relationships between an ASD diagnosis and disfluency patterns
  - Examine the Non-ASD group more closely to gain insight into the specificity of certain disfluency patterns in ASD versus ASD+
  - Investigate disparities in specific types of Non-SL disfluencies i.e. interjection use between groups
  - Explore factors impacting relationship between disfluency and social impairment

- Results from a larger sample could inform targeted treatments for social communication impairments and disfluencies in ASD and other neurodevelopmental disorders