Disfluency & ASD

Linguistic Approaches to Autism and Neurodevelopmental Disorders

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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
## Differential Diagnosis

<table>
<thead>
<tr>
<th>Type of Behavior</th>
<th>Typical Disfluencies</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>
<td></td>
</tr>
<tr>
<td>Sentence Revisions</td>
<td>Prolongations</td>
<td>Sound prolongations</td>
<td></td>
</tr>
<tr>
<td>Interjections/Fillers</td>
<td>Blocks</td>
<td>Sound insertions</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location of Behavior</th>
<th>Typical Disfluencies</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>
<td></td>
</tr>
<tr>
<td>Typically initial position</td>
<td>Typically initial position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tendency to cluster</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Typical Disfluencies</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>
<td></td>
</tr>
<tr>
<td>2x as disfluent</td>
<td>Noticed &gt;10%</td>
<td></td>
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</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Reactions</th>
<th>Typical Disfluencies</th>
<th>Stuttering</th>
<th>Atypical Disfluencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typically no reactions &amp; minimal awareness</td>
<td>Secondary behaviors</td>
<td>Typically no reactions &amp; minimal awareness</td>
<td></td>
</tr>
<tr>
<td>Avoidances</td>
<td>Fears/Anxiety</td>
<td></td>
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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 effect 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, Mcsweeny, 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


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