

A prosodic contribution to the understanding of stuttering in European Portuguese

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Background

Past studies showed that:

- There was more stuttering at initial words of long sentences than of short sentences containing exactly the same sequences of words (Torrnick & Bloodstein, 1975);
- The relation between syntactic structure and fluency could vary according to the task proposed to speakers (Gordon & Luper, 1989);
- Stuttering is a prosodic disturbance (Bergmann, 1986). This is further explored by Bloodstein (1995) or Hubbard (1998), where the relevance of prosodic constituents and word stress is argued for;
- Syntactic complexity plays an important role in stuttering (Silverman & Bernstein, 1997).

More recently:

- In Gordon and Luper's vein (1989), Logan (2001) saw that speakers produce more disfluencies in spontaneous speech;
- Logan's results do not support the hypothesis that one type of syntactic structure affects the speech fluency of adults who stutter, more than any other type of syntactic structure;
- There are no differences in either the percent of syllables stuttered or the percent of syllables with other types of disfluency across the 4 categories of length matched sentences (Logan, 2001);
- Participants articulated syntactically complex sentences at a significantly faster rate than syntactically simple sentences (Logan, 2001);
- Arbisi-Kelm (in press) showed that stutterers appear to be sensitive to prosodic breakdowns well before articulation of the problematic material because they frequently produce disfluencies both in prosodically predictable anticipatory and target positions (e.g. final PhP within ip)

Present Research

Our goal: test the importance of syntactic complexity, (prosodic) length and (other) prosodic factors on the fluency of stuttering adults, in European Portuguese (EP).

Measurements: (i) segmental and syllabic lengthening in stuttering and its prosodic distribution; (ii) duration and prosodic distribution of both filled and silent pauses (excluding breathing pauses); (iii) prosodic loci of all stuttering events (within the PW, the PhP and the I, and relative to stress); (iv) prosodic distribution of stuttering by complexity type; (v) prosodic distribution of stuttering by length (in terms of number of both syllables and PW).

Predictions: we predict that the production of disfluencies increases (i) as the syntactic structure of NP Subject becomes more complex (following Logan's 2001 syntactic complexity definition), and (ii) as the NP Subject becomes longer (in terms of number of syllables/PW). We also hypothesise that disfluencies occur more frequently at the head of prosodic constituents (PW, PhP and I).

Methodology

Procedure: sentences read in random order by two male age matched adult speakers (a stuttering and a non stuttering speaker) and recorded in a quiet room with Marantz PMD670 and two microphones Beyerdynamic Opus 55.18 MK II. The 44100Hz digital files were converted to 22050Hz format, edited with Adobe Audition 1.5 tool (Adobe Systems Incorporated, 2004) and each sentence was annotated using Praat 5.0.01 (Boersma & Weenink, 2007).

Corpus: a total of 30 sentences (38 Is) manipulated in terms of NP Subject, VP and Sentence (i) syntactic complexity (see table aside) and (ii) length (number of syllables – 2 to 25 – and PWs – 3 to 8) x 2 speakers.

Scale	NP Subject Syntactic Structure	VP Syntactic Structure
1	Unit + N	V
2	Det + Adj + Adj + N	V + CL
3	Det + N + PP	Adv + PCL + V
4	Det + N + PP + PP	V + Adv // V + Adj // V + Prepos
5	Det + N + Rel. Cl	V + N // V + Det + N
6	Det + N + Rel. Cl + Mod	V + CL + Det + N
7	...	V + N + PP // V + Det + N + PP

Results

Syntactic Complexity

Frequency of Stuttering by Complexity: Sentence (S)

Frequency of Pauses by Complexity: Sentence (S)

Frequency of Stuttering by Complexity: NP / VP (S)

Frequency of Silent Pauses by Complexity: NP / VP (S)

These results are similar for each stuttering event, including pauses.

Syntactic complexity also doesn't influence frequency of control speaker pauses.

Length

Frequency of Stuttering by Length: Sentence (S)

Frequency of Stuttering by Length: Sentence (S)

Pauses

- When length increases, pauses do not become more frequent, for both stutterer and control speakers.

Prosody

Type of Stuttering Event

PW prominence: stuttering occurs more frequently at unstressed syllables.

Intonational Phrase

These results do not change when subjects are long.

Silent pauses are predominantly short and occur, for both stutterer and control, between PhPs or Is. Unlike control, the stutterer also pauses between clitic and PW.

This stuttering event occurs more frequently at the first segment/syllable of the PW which is the PhP head.

Lengthening in the Phonological Phrase

Lengthening in the Intonational Phrase

Main findings

- The higher or lower frequency of stuttering events is **not** dependent on:
 - the syntactic complexity of NP, VP or sentence;
 - the length of NP, VP or sentence (in terms of number of syllables or number of PWs).
- Pauses and Lengthening are the two most frequent types of stuttering events.

- Prosodic constituency is shown to constrain stuttering patterns: PW(; [;]PhP; [;]PhP
 - Stuttering occurs at the beginning of the PhP's first PW (usually unstressed), except lengthening which occurs at the opposite edge of PhP (the last PW – head);
 - Stuttering occurs at the Intonational Phrase medial position, even with subjects longer than 8 syllables;
 - Short silent pauses are predominantly produced between PhPs and between Is; unlike control, the stutterer also pauses between clitic and PW: PW(CL_PW).

Future work: prosodic phrasing and intonation in the spontaneous and read speech of stutterers and non-stutterers (4 speakers)