

# Sentence Accents and Stuttering Frequency in Dutch

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## 0. Introduction

This article investigates the relationship between stuttering and stressed syllables in utterances. This study can be situated in the context of research into the distribution of stutter locations in utterances. Johnson and Brown (1935) were among the first to establish system in the occurrence of stutter locations. They distinguished four factors which seem to be systematically linked to stuttering.

First, their research indicated that there are no phonemes that consistently cause stuttering: every stutterer has problems with certain sounds but these sounds seem to be determined individually. All studies dealing with the phonetic factor suggest that consonants always cause a higher incidence of stuttering than vowels. Another finding is that people hardly ever stutter on the neutral vowel [ʌ].

Secondly, Brown (1937) established a relationship between stuttering and word class: adults stutter more frequently on adjectives, nouns and verbs (content words) when reading. They have fewer problems with conjunctions, prepositions and articles (function words). Contrary to the phonetic factor, the grammatical factor is not individually determined.

Thirdly, Johnson and Brown (1935) assume that stuttering occurs more frequently on words at the beginning of syntactic units (e.g. the beginning of a sentence, the beginning of a paragraph ...). Especially the first three words of a sentence seem to cause problems: e.g. the first word of a syntactic unit coincides with a stutter location 80% more often than the other words in an utterance.

Further, Brown investigated word accents and found that stuttering often occurs on the stressed syllables of polysyllabic words. The same relationship holds for words of which the stressed syllable is not the first one (stress on the first syllable is the commonest in English). He also found a link between stuttering and word length: a higher number of syllables increases the likelihood that people stutter on this word. Brown's hypotheses have been looked at in numerous studies and the findings have been extended to other conditions: they also seem to apply to spontaneous speech and to children from the age of 7. Contrary to Brown, not everyone agrees that these factors are sufficient to explain stutter locations and other variables were investigated. Thus

Hubbard and Prins (1994) found a significant relationship between stuttering and word frequency: lower word frequencies increase the likelihood of stuttering. This factor holds independently of Brown's factors and applies to adults as well as children. A second addition to Brown's parameters is 'information value', i.e. the predictability of words in a given context. Words that are easy to derive from the context have a limited information value. Words that are difficult to predict are more informative and seem to cause more stuttering.

Wingate (1988) emphasised the importance of 'linguistic stress' on stuttering frequency. Linguistic stress refers to 'the perception of prominence given to syllable constituents within sentences' (Wingate, 1988: 246). Brown (1938), who examined the relationship between stuttering and stressed syllables of polysyllabic words, uses the term 'accent' only to indicate word accent. In Brown's research, subjects stutter significantly more often on stressed syllables of polysyllabic words. Wingate suggests that this may also be the case for stressed syllables in sentences, i.e. sentence stress.

Bergmann (1986) has investigated Wingate's hypothesis in an experiment where subjects had to read an iambic poem. The results indicate that subjects stutter more frequently on stressed syllables. It should be pointed out that Bergmann used an iambic metre since English has many stressed syllables at the beginning of words: in previous research it was unclear whether stuttering is caused by the phenomenon of stress (prosody as a determining factor) or by the beginning of a new word (syntax as a determining factor).

In addition to the research of Wingate and Bergmann, Von Klouda and Cooper (1988) looked at the effect of contrastive stress on stuttering frequency. They found that stutterers are able to assign contrastive accents to the appropriate syllables, but that words with contrastive accent are typical stutter locations. This is explained by referring to the information value of words: words with a contrastive accent are highly informative and thus likely stutter locations. Von Klouda and Cooper also modify Brown's hypothesis that stuttering occurs most often on the first words of syntactic units: Brown's hypothesis only holds when sentences do not contain contrastive stress.

Prins, Hubbard and Krause (1991) once more confirm Wingate's hypothesis, but they add that stutter locations most often coincide with stressed syllables in polysyllabic words. Their explanation is as follows: if the speech rate is higher, speakers are likely to make more mistakes. Since the speaking rate of polysyllabic words is higher, the incidence of stuttering rises.

On the basis of the above-mentioned studies, it seems reasonable to assume that there is an interesting relationship between sentence accent location and frequency of stuttering. This is accounted for by the fact that words with sentence accents convey communicatively important information. It should be emphasized, however, that studies

dealing with the relationship between sentence accent and stuttering have never considered the possible connection between sentence accent and sentence intonation. In this perspective, it can be argued that sentence accent and intonation are closely related phenomena in that sentence accents are places in utterances where speakers have to take important decisions regarding the general shape of the intonation contour. It can be assumed that some of these decisions are rather straightforward, while others may be more complex and may thus require more processing on the part of the speaker. On this basis, it is hypothesized that the underlying reason for sentence accents to be typical stutter locations has to do with their relationship with sentence intonation, which would explain why intonation-based speech therapy has had considerable success in the treatment of stuttering.

In order to investigate the possible relationship between sentence accent and stuttering, Dutch speech data were collected from stutterers in two task conditions. The analysis of these data will be the subject of this paper.

## **1. Method**

### **1.1. Subjects**

The informants in this study were six adult stutterers (3 men, 3 women). They were all native speakers of Dutch and apart from stuttering they did not have any other speech disorders. The educational background of the subjects differed considerably. At the moment of this study, the youngest informant was 15 years old and the eldest was 46 years of age. The average age of the subjects was 32.50 years. In all subjects, stuttering began during early childhood, i.e. between the age of 3 and 6. All informants had participated in several stuttering therapies in the past. Their therapy history is summarized in table 1.

On average, subjects had had 3.67 years of stuttering therapy. Most subjects had had speech therapy but at the moment of research two of the six subjects had been 2.5 and 12 months in a self-help group which uses the Hausdörfer method. This method teaches subjects to sing every word and attempts to create a positive personality attitude. During the data collection these subjects were explicitly asked not to use the method. It was observed that one subject relied on the method anyway during a small part of the test, but these data were excluded from further analysis.

For each subject, stuttering severity was measured by means of Riley's Stuttering Severity Instrument (1972): stuttering severity was established by two researchers independently. This test takes into account three different aspects of stuttering:

- The frequency of repetitions, prolongations ... of sounds and syllables. For every speaker, the presence of stuttering on words was counted. The first sentences of a

text were not taken into account for data analysis. Furthermore, stutter frequencies were counted in two different task conditions, i.e. in a reading task and spontaneous speech.

- The average duration of the three longest hesitations. Depending on this duration a mark is given from 1 (short hesitations) to 7 (longest hesitations).
- Physical side movements are noted. The side movements are divided in four groups and for each group their presence was indicated on a 6-point scale.

Afterwards, the sum of the scores for the different parts of the test has to be made. This number is assumed to give an accurate indication of stuttering severity. Stuttering Severity Measures are given in table 1. It can be observed that stuttering severity varied from mild to very severe.

*Table 1: Summary of informant characteristics.*

<b>Informant code</b>	<b>Gender</b>	<b>Age (in years)</b>	<b>Stuttering Severity (Based on Riley's test)</b>	<b>Speech therapy (in years)</b>
M 11	m	44	7 = mild	2
M 12	m	23	23 = moderate	10
M 13	m	39	25 = severe	4
V 11	f	15	31 = very severe	3
V 12	f	28	28 = severe	1
V 21	f	46	32 = very severe	2
		X = 32.50		X = 3.67

## **1.2. Procedure and materials**

After collection of personal information, there was a short conversation in which the assignments were explained. Two tasks were administered in the same order of presentation: first the subjects had to read a text and after that they were asked to tell a story on the basis of pictures. According to Newman (1954) the second task closely resembles spontaneous speech. These two different task conditions were chosen such that it was possible to examine whether stuttering can be associated with sentence accents in reading as well as in spontaneous speech. A second reason to use a reading task is that stutterers, especially adults, are often argued to be very competent in using 'reformulation' strategies: while speaking spontaneously, stutterers often replace a 'difficult' word by a synonym that is easier to pronounce.

The first task consisted of reading a written text of 60 sentences containing affirmative statements as well as questions. About half of these sentences were compound

sentences, linked with subordinating or coordinating conjunctions. Moreover, the text was designed such that 20 sentences contained more polysyllabic than monosyllabic words: most of polysyllabic words had two or three syllables. In order to get an idea of the level of difficulty of the reading text, the Flesch-Douma formula was applied. This formula calculates reading ease on the basis of two characteristics, i.e. sentence length and word length. For Dutch, this formula looks like this (Burger and De Jong, 1996: 76):

- Reading ease =  $206.84 - (0.77 \times \text{length of the words in syllables}) - (0.33 \times \text{length of the sentences in words})$ .

The application of this formula gives a score of 62 for the reading text, which corresponds to a standard level of difficulty.

In the second task, subjects were asked to tell a story about nine pictures. It was suggested explicitly to say at least two sentences per picture so that at least 150 words per person would be available.

Informant deliveries were taped with a DAT-recorder and a Sennheiser microphone, which was approximately at a distance of 15 centimetres from the speaker's mouth. Subject deliveries were digitised at a sampling frequency of 16.000 Hz

## **2. Analysis procedures**

### **2.1. Stutter locations**

In the first instance stutter locations were determined. A stutter location was defined as the repetition of phonemes, syllables, words or word groups. In addition, any noticeable prolongation of sounds or a break between two words which takes longer than 200 ms was taken as a stutter location if the pause could not be explained on the basis of syntactic grounds. In order to improve the accuracy of the calculations, two researchers established stutter locations independently of each other. There was generally good agreement on about 86 % of stutter locations. The cases of non-agreement were not used in the data analysis.

### **2.2. Sentence accent placement**

In Dutch, the position of stressed syllables in words can differ. Despite of this, the stressed syllable can often be predicted on the basis of phonological rules. In a sentence context, some syllables are more prominent than others and these can be regarded as sentence accents. The theoretical approach in dealing with sentence accents that is adopted in this paper is that of the Institute of Perception Research ('t Hart, Collier and

Cohen, 1990). This approach holds essentially that each word accent which is realised in a sentence context can be regarded as a sentence accent. Hence, sentences can have several sentence accents. The number of sentence accents and their location largely determine sentence intonation.

Sentence accents can only be attributed to a syllable in comparison to other unaccented syllables. To easily find sentence accents, reiterant speech can be used: instead of pronouncing all sounds, every syllable is replaced by a constant series of sounds (e.g. ma-ma). This method is very useful because all the relevant prosodic properties of an utterance are maintained, whereas the intrinsic characteristics of sounds are held constant. In his research, Wingate (1988) determines sentence accents on the basis of intensity only, but it has been shown that this parameter is rather weakly related to sentence accents (Lehiste, 1970; Rietveld and Van Heuven, 1997). In this study, three researchers determined the location of the sentences independently of each other. Overall, there was agreement on the position of sentence accents in 90% of the cases: cases of non-agreement were not included in further data processing.

### **2.3. Data Processing**

All the syllables in the corpus were coded as to whether or not they were realised with a sentence accent. The following categories were distinguished:

- Syllables which normally carry word accent but which do not have a sentence accent.
- Syllables which both have a word accent and a sentence accent.
- Syllables with neither a word accent nor a sentence accent.

In addition, information was included regarding subjects' stuttering severity, sentence length, word length, task condition (read vs spontaneous speech), word class, word frequency and whether the syllables were stuttered or not.

It should be noted that function words (more specifically personal pronouns, conjunctions, prepositions and articles) were not taken into account in the calculations. The main reason for this was that researchers agree that people hardly ever stutter on function words (Brown, 1937; Eisenson and Horowitz, 1945; Griggs and Still, 1979). Moreover, function words are normally not accented (Rietveld and Van Heuven, 1997). Since this study deals with the relation between sentence accents and stuttering and function words cannot be associated with either, it was felt appropriate to leave out this word class.

### 3. Results

Although the prime interest of this paper is the effect of sentence accents on stuttering, the other parameters cannot be neglected. Therefore, the different parameters were looked at separately.

As far as stutter location and the task condition is concerned, 14% of all syllables (5774) were characterised by stuttering behaviour. In spontaneous speech, subjects stuttered on 15% of the syllables, while they stuttered slightly less frequently in the reading task (13.5%). Application of a Chi-square test indicates that this observed difference is not significant (Chi-square=2.289, d.f.=1,  $p < 0.1303$ ).

The second parameter that was investigated was the relationship between word class and stuttering frequency. It was mentioned earlier that function words were not taken into account in this respect: this means that personal pronouns, prepositions, articles and conjunctions were not included in the data. The proportion of stuttering on the different word classes is given in table 2. Application of a Chi-square test reveals that the observed differences in stuttering frequency are not significantly related to word class (Chi-square= 13.470, d.f. = 1,  $p < 0.2637$ ).

*Table 2: Proportional occurrence of the different word classes in the corpus and stuttering frequency for each category. The middle column indicates the proportional occurrence of the different word classes in the corpus.*

<b>Word class</b>	<b>Proportional occurrence</b>	<b>Stuttering frequency</b>
Adjectives	9.82 %	13.76 %
Adverbs	23.64 %	11.72 %
Nouns	27.78 %	15.02 %
Verbs	22.57 %	13.58 %
Numerals	3.86 %	18.42 %

The third dimension that was looked at was stuttering and word length, which is summarised in table 3. The number of words with more than four syllables only constituted a very small proportion of all words. Moreover, they were all produced by the same subject. Most words were mono- and bisyllabic: together they make up 71.43 % of the corpus. The average word length is 1.63 syllables per word. A Chi-square analysis indicates that there is a significant relationship between word length and stuttering frequency: This relationship is such that monosyllabic and bisyllabic words are most strongly related to stuttering frequency, while this relationship is weaker for the other categories.

*Table 3: Relationship between word length and stuttering frequency. The middle column indicates the proportional occurrence of each word length category in the corpus.*

<b>Word length</b>	<b>Proportional occurrence</b>	<b>Stuttering frequency</b>
Monosyllabic words	30.97 %	16.11 %
Words with two syllables	40.46 %	14 %
Words with three syllables	21.67 %	10.63 %
Words with four syllables	5.82 %	12.80 %

The fourth aspect of this investigation focused on the relationship between word frequency and stuttering frequency. Word frequency was indicated taking into account the function of the word in the sentence: the adjective ‘mooi’ (beautiful) may thus have another frequency than the adverb ‘mooi’. The word frequencies were based on the CELEX-database. In order to investigate this variable, an analysis of variance was carried out with stuttering as an independent variable and the word frequency as a dependent variable. This analysis was not significant ( $F(1,5452) = 0.5873$ ,  $p < 0.4435$ ). Finally, the relationship between sentence accents and stuttering frequency was investigated. In general 28.30 % of all syllables were realised with a sentence accent. Syllables carrying sentence stress were stuttered in 31.85 % of all cases. When syllables do not carry sentence accent, stuttering only occurs in 5.97 % of the cases. This difference is statistically significant (Chi-square = 655.343, d.f. = 1,  $p < 0.0001$ ). This result suggests that stuttering is clearly linked to sentence accents in this corpus. The significance levels do not only hold for both task conditions together, but also apply to spontaneous and read speech separately.

#### **4. Discussion**

From the results, it appears that stuttering frequency does not differ according to the task conditions: there is no significant difference in stuttering frequency in spontaneous speech and the reading task. This is not consistent with the literature on the subject, which relates stuttering to either of the two conditions. Both findings have generated various interpretations.

If it is assumed that stuttering occurs more often in read speech, the anticipation theory is often used as an explanation. Anticipation refers to “the fearful premonition of impending blockage that most stutterers begin to experience at some time in the development of their speech problem” (Bloodstein, 1995: 274). Evidence for this theory

is found in the fact that physiological changes, like reactions of the skin and higher blood pressure, take place immediately before moments of stuttering. Also the phenomenon of consistency, which assumes that stutterers tend to stutter on the same words when reading a text a few times, supports the anticipation theory. According to Johnson (1961) stuttering comes about because the stutterer makes certain evaluations of his speech. He remembers for instance former difficulties and he is worried that he is going to stutter again. This induces an attempt of avoiding stuttering, with the result that his stutter even becomes worse. While reading, a stutterer will generally anticipate more on sounds that are difficult for him, because he is able to survey bigger parts of a text.

A second reason to assume that stuttering is worse while reading is that a written text usually contains more content words than spontaneous speech, which has a higher incidence of function words (Miller, Newman and Friedman, 1958: 387). The frequency of stuttering is substantially lower on function words: as a result stuttering frequency in read speech is higher. The possible importance of function words was eliminated in this investigation, because they were omitted from the data analysis.

Furthermore, it can be argued that the sum of different words in a written text is bigger. This enhances stuttering, because words that have been recently used are more present to the mind. This hypothesis based on a study of 'normal' speakers' disfluencies has been inappropriately generalised to stutterers' speech, because Wingate (1988) indicates that stutterers usually use more different words than non-stutterers. For stutterers, the number of different words used in speech is higher than in a reading task, whereas it is quite the opposite for regular speakers. In the light of Wingate's findings, the former hypothesis has to be questioned. Yet Wingate's findings can be used to support the hypothesis that there is more stuttering in a reading task. Stutterers are very good at substituting words on which they expect difficulties. The fact that stutterers can give synonyms faster and better than regular speakers, supports this hypothesis (Wingate, 1988: 208-210). In a reading task, word substitution is not possible and that is why there may be more interruptions.

The arguments in favour for a higher incidence of stuttering in spontaneous speech have to do with the communicative situation. In face-to-face interactions, it is expected that there is eye contact with the listener, but stutterers seem to have serious difficulties with eye contact situations: Hood (1975) found that his subjects did not stutter so often when talking to a blindfolded listener.

Another factor that seems to play a role is that stutterers are in direct contact with listeners' reactions during a conversation. When a stutterer notices that a listener is getting annoyed with his disfluencies, stuttering will become worse (Bloodstein, 1995: 300).

Furthermore, it is often argued that spontaneous speech requires more planning, since the speaker has to think about the content of his message and about the grammatical forms he will be using. Bloodstein (1995) found that stutterers have fewer difficulties in pronouncing isolated words (which hardly require any planning) than in producing complete sentences. In addition, Ryan (1992) found that stutterers generally speak more fluently when they have more time available for the planning process: the incidence of stuttering decreases significantly as speech rate decreases.

The results of this study indicate that there is no essential difference in stuttering frequency in the two task conditions and this is quite the opposite of what is generally found. The fact that other researchers have found a difference between spontaneous speech and reading may be accounted for by the fact that spontaneous speech has generally more function words. As was mentioned earlier, function words have been excluded from our analyses and this may explain why our results are different in this respect.

The second aspect that was investigated in this study was the relationship between stuttering and word class. It has been argued earlier (Brown, 1937) that there are no substantial differences within the category of content words and the results of this study are entirely in line with this finding.

The third parameter that was examined was the relationship between stuttering frequency and word length. Brown (1937) found a significant correlation between word length and stuttering: people stutter more often on longer words. Since Trotter (1956) and Silverman & Williams (1967) have replicated this result. In this study, stuttering is also significantly related to word length, but this relation is different from what could have been expected: subjects stutter more frequently on monosyllabic words.

In recent studies, the findings of Brown and his followers have somewhat been adapted. Peters (1989) and Lieshout (1996) have only found a significant relation between stuttering and words consisting of three or more syllables. It is precisely this category that is very small in this study. In addition, some investigators suggest that word length is a very difficult parameter to handle, because it is not purely linguistic. MacKay and MacDonald (1984) have pointed out that all speakers make more mistakes when speaking faster: since the speech rate is higher on polysyllabic words, the incidence of stuttering rises. That is why many researchers prefer the concept of 'word prominence' to word length. Word prominence is defined as "the accent to which a word is conspicuous by its introduction of new and/or important information to the listener" (Hubbard and Prins, 1994: 469). In this perspective, the incidence of stuttering will be higher on words which are important to convey the message since the stutterer will pay more attention to them. As a result, the parameter of word length cannot be considered

separate from the parameter of accent. When a word is important in the communicative situation, this word will typically carry a sentence accent. In this corpus, the relationship between word length and sentence accent is significant in that there are more sentence accents on monosyllabic words than on polysyllabic ones. This suggests that the underlying factor of stuttering is not word length, but rather sentence accent.

The next parameter that was investigated in this study was the relationship between stuttering and word frequency. In the past, it has been assumed that speakers stutter more often on words that they are less familiar with, where word familiarity is defined in the literature “ (...) as the frequency with which a word is experienced, either in perception or production. Words that occur more frequently in spoken or written texts are generally assumed to be more familiar to the reader.” (Hubbard and Prins, 1994: 564). In this definition, a direct link is explicitly made between word frequency and word familiarity: this study, however, does not suggest a significant relationship between word familiarity and stuttering frequency.

The final aspect that was investigated in this study is the relationship between the location of sentence accents and stuttering. This aspect was investigated in both spontaneous and read speech. In his first publication, Brown suggested that the parameter of word accent contributed significantly to a higher incidence of stuttering. But Brown’s research was essentially limited to the study of accents in polysyllabic words and neglects the accents of monosyllabic words. Wingate (1988) even stronger emphasized the unique role of sentence accents in stuttering by expanding Brown’s parameter of accent to linguistic stress, i.e. word accent as well as sentence accent. Wingate suggests that the role of linguistic stress in stuttering can be accounted for by linguistic planning.

Whereas Brown does not mention sentence stress, Wingate does not always keep the concepts of ‘word accent’ and ‘sentence accent’ well separated. Moreover, Wingate’s method to determine accents on the basis of intensity is very doubtful, since it has been shown that intensity is only weakly related to the perception of sentence accent: pitch movements on syllables are a much more significant cue (‘t Hart, Collier and Cohen, 1990)

In this study, linguistic accent was established for each syllable irrespective of whether or not it actually carries a sentence accent and/or word accent. In one category, namely in syllables with word stress as well as sentence stress, both accents coincide. From this study it is clear that it is sentence accent and not word accent which is the determining factor for stuttering. This finding is in line with Bergman (1986) who found a strong correlation between sentence accent and stuttering. In addition, Von Klouda and Cooper (1988) found that stuttering frequency is highest on words with a contrastive accent.

The problem with these investigations is that the experimental tasks considerably simplified subjects' prosodic decisions when compared to normal speech (Prins, Hubbard and Krause, 1991). Thus it is hard to generalise their findings to normal speech.

This investigation was precisely about normal speech and it can be concluded that there is a strong correlation between sentence accent and stuttering with minimal interference with other parameters. This relationship between sentence accent and stuttering can be accounted for in terms of the speech planning process. Stutterers have more difficulties with speech planning than regular speakers do (Wijnen and Broers, 1994; Postma and Kolk, 1993; Perkins, Kent and Curlee, 1991). In each of these investigations the cause of planning difficulties is situated in the phonological coding phase and in this phase prosodic parameters are assigned to speech segments. Phenomena which need more planning, will more often cause stuttering. It can be argued that sentence accents need more planning than word accents, since it has been shown that stutterers have relatively few difficulties in uttering isolated words, even when these consist of several syllables. Levelt (1989) argues that information about word accents is stored together with the lexical form of words. Together with the lexical form, information is activated with respect to the lexical stem and possible affixes, information about the number of syllables and information about which syllable carries a word accent. Thus, the word accent can be determined without any contextual information, since "the metrical pattern of words is stored in the mental lexicon" (Levelt, 1989: 373). But with sentence accent, the context is essential: sentence accent cannot be attached to a syllable in the sentence in a standard fashion.

The fact that some sentence accents require more planning than others is also implicit in phonological analyses of Dutch sentence intonation by Gussenhoven (1988). In his analysis, sentence accents are associated with any of three possible tonal targets and the sentence intonation contour is derived by phonological rules operating on these tonal targets. This is exemplified in (1a) and (1b):

(1a) Hij werkt hard < He works hard >

HL HL

(1b) Hij werkt hard

H L HL

In (1a) the sentence accents are straightforward direct surface realisations of two high-low tonal elements, whereas in (1b) an additional phonological rule has to be applied which deletes the low of the first tonal element and establishes a direct connection between the remaining high and the adjacent high of the second tonal element. This suggests that there is a close relationship between accent location and decisions that have to be taken by speakers regarding the application of phonological rules pertaining to sentence intonation. This makes the location of sentence accents focal points for intonational decisions which require a substantial degree of additional planning and processing. As a result, stuttering frequency may increase. This account is not only consistent with the relationship between accent location and stuttering, but also with the relative success of intonation therapies: substantial training to deal with intonation problems has often been reported to yield a significant reduction of stuttering.

This interpretation has important implications for stuttering research. It does not only suggest that the location of sentence accents in utterances are likely stutter locations, but it also implies that certain sentence accents are more likely to be stutter locations than others, namely those which require a significant amount of intonational planning. This hypothesis is presently being explored by means of a detailed investigation of pitch contours which correlate with the sentence accents in the Dutch data collection.

## **5. Conclusion**

In this paper, the relationship between sentence accent placement and the occurrence of stuttering was investigated. It was shown that the location of sentence accents is significantly related to the incidence of stuttering: this holds for both spontaneous speech and the reading task. It was hypothesized that the underlying factor to account for this is not sentence accent location per se, but the fact that sentence accents are focal points where important intonational decisions have to be taken by speakers. As the planning and processing load increases, the likelihood of stuttering increases as well.

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