Original Article

The Effect of Word Meaning on Speech DysFluency in Adults with Developmental Stuttering

Elham Masumi; Zohre Arani Kashani[1]; Ali Ghorbani; Mohammad Kamali
Iran University of Medical Sciences, Tehran, Iran

Objectives: Stuttering is one of the most prevalent speech and language disorders. Symptomology of stuttering has been surveyed from different aspects such as biological, developmental, environmental, emotional, learning and linguistic. Previous researches in English-speaking people have suggested that some linguistic features such as word meanings may play a role in the frequency of speech non-fluency in people who stutter. The aim of this study was to determine the effect of word meanings on the frequency of dysfluency in Persian-speaking adults with developmental stuttering.

Method: This cross-sectional descriptive-analytic study was performed on 14 adults who stuttered. Their average age was 25 years. The frequency of non-fluency instances was evaluated upon reading two lists containing 60 words and 60 non-words. The words were selected on the basis of common Persian syllable structures. 'Kolmogoro-Smirnov one sample test' and paired t-test was used to analyze data; the significance level was set at $P < 0.05$.

Results: There was a significant difference between the dysfluency in word and non-word lists ($p<0.05$).

Conclusion: The findings of this study indicate a significant increase in the frequency of dysfluency on non-words than on real words. It seems that the phonological encoding process of non-word reading is much more complex than for word reading, because, in non-word reading, the component of semantic content retrieval (word meaning) is missing when compared to word reading.

Keywords: Developmental stuttering, Persian-speaking adult, word, non-word, word meaning

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Introduction

The symptomatology of stuttering has been extensively investigated from a linguistic perspective, and attempts have been made to ascertain the loci and frequency of stuttering moments (1-3). Brown (4, 5), Brown and Moren (6) and Johnson and Brown (7) were the first to investigate the role of word length, word position, and initial sound and grammatical category on stuttering frequency, i.e. the distribution of stuttering moments recorded during speech tasks performed by people who stutter. Accordingly, it was suggested that the presence of one or more of the above-mentioned factors strongly influenced the likelihood of stuttering on a word (3, 8-19).

Generally, the most common notion pertaining to the influence of linguistic parameters on speech non-fluency is attributed to meaningfulness, linguistic complexity, linguistic load, and emotional content associated with words (17). This viewpoint was reinforced by Hahn (11, 12) and Eisenson and Horowitz (10). They suggested that, an increase in propositional value produces a greater range of percentage of stuttered words among various parts of speech. Brown (4) provided an intuitive rationale for the impact of word meaning on the frequency of dysfluencies. He suggested that, the stutterer is more unwilling to stutter words which are crucial for the meaning of what he is saying than on words that are relatively unimportant to this meaning. The increased unwillingness to stutter on words crucial for sentence meaning should make stuttering more likely to occur on those words.

The role of word meaning and stuttering frequency is evident when we consider research pertaining to the investigation of loci and frequency of stuttering moments on different grammatical categories. Brown (5) considered grammatical category (content

1- All correspondence to: Zohre Arani Kashani; Email: <zakashani@ymail.com>

words including; nouns, main verbs, adverbs, adjectives and function words including; pronouns, articles, prepositions, conjunctions, auxiliary verbs) as one of the four important factors that determine the loci and frequency of speech non-fluency. Higher stuttering moments are recorded on content words when compared to function words. Therefore, word meaning is frequently considered as a viable explanation to the distribution of frequency of dysfluency across these grammatical categories. The content word category is considered to be in a dynamic state as new words are constantly added to this group, whereas function words belong to a closed linguistic set and as such new words are rarely added to this category (4). Therefore, Brown (5) and other researchers proposed that content words carry more 'meaning' as compared to function words, when used in isolation.

More recently, a theoretical model for stuttering was proposed in which differences in frequency of speech non-fluency pattern on grammatical categories in adults and children who stutter. That is, adults stutter more on content words when compared to function words, whereas children stutter more on function words when compared to content words (8, 20-23). It is suggested that children use a 'stalling' strategy by stuttering on function words that are relatively simple and carry less meaning, thereby creating a time window to complete the processing of the more complex content words. Simply put: the difference in frequency of speech dysfluency between content and function words is based on the assumption that function words do not carry full lexical meaning but have a grammatical or function role, whereas content words play a crucial role in conveying semantic information (22). However, it should be noted that function words are not devoid of meaning. There is a lack of empirical resources in this field and questionable reliability in attempting to scale the amount or extent of meaningfulness for content and function words in a particular language (24). The truth is that almost all words have both grammatical and semantic value (25).

Thus, if one were to best isolate the influence of word meaning on frequency of speech dysfluencies, dichotomized reading passages or lists consisting of words and non-words might be employed. The use of such stimuli that are mutually exclusive will not confound the interpretation of differences in frequency of speech dysfluency between words and non-words.

According to 'dual-route' models of reading, there are two separate mechanisms; the lexical route and the sublexical route (26). In the lexical route, words are recognized from their holistic form. In the sublexical route, the written words or non-words are converted in a different way from the written form into their phonological form. The sublexical route is assumed to include the following three stages: graphemic parsing, graphophonemic conversion, and phoneme blending (27).

Hedge and Packman et al. have used reading 'passages' in adults who stutter, to compare the frequency of speech dysfluencies between passages that consisted of either words or non-words (28, 29). Participants displayed a higher proportion of stuttering episodes while reading the non-word passages. Similar findings were reported by Dayalu et al (25). In spite of the importance of word meaning in the frequency of speech dysfluency in adults with developmental stuttering, to our knowledge, no study has been conducted in this field in Iran yet.

Methods

Participants - This study is a cross-sectional descriptive-analytic study. The sample size used in the study was based on the need to have sufficient statistical power and according to the standard deviation reported by Dayalu et al. Fourteen stuttering adults (mean= 24.93 years, SD= 5.498, range= 20-39, 12 males and 2 females) participated in this study. The inclusion criteria were: being aged above 20 years, being diagnosed as individuals with developmental stuttering by a speech-language pathologist in a speech pathology clinic, having no other neurological and/or communication disorders other than stuttering, no history of stuttering and/or speech therapy sessions at least 3 to 6 months prior to the study. Persian was the first language of all participants and every participant had received -at least- high school education. Exclusion criteria were: unwillingness to continue the evaluation and video and audio recording.

Test materials - The two lists of words consisting of 60 words (i.e. meaningful words) and 60 non-words (non-meaningful words) were compiled. The words were matched for initial sound, letters, syllabic structure and syllabic length. Furthermore, every attempt was made to construct the non-words to conform to the phonotactic constraints of the Persian language and was phonetically similar to their meaningful counterparts.

Procedure - Initially, the subjects completed the consent form and the demographic questionnaire. The stuttering severity assessment was performed by

reading the text containing 200 words. Then participants were given two lists containing 60 words and 60 non-words to determine the effect of word meaning on the frequency of speech dysfluency in the reading task. Participants were instructed to read the words and non-words aloud, without the use of any therapeutic techniques that may be self-taught or learned during therapy. If participants were to experience a moment of stuttering during the process they were asked not to control it. They were also instructed to read each list individually and only once. We recorded auditory and visual symptoms by a video camera (SAMSUNG model VP – DX 10) and voice recorder (Kingston model DVD 902).

Statistical analysis - The distribution of the measurement data was tested for normality with the Kolmogorov-Smirnov one-sample test. When the distribution of the measurements was normal, the data was analyzed using SPSS 16.0. Paired T-test was used and odds ratio was calculated, and the significance level was set at $P < 0.05$.

Ethical Considerations - In this study the participants received information concerning the study, and all participants signed the informed consent before participation. They were assured that their information would remain confidential. And the tests were completely safe and non-invasive.

Results

The mean frequency of speech dysfluency in the list of words was 7.79, and in the list of non-words, it was 38.07. The result of the paired T-test indicated a significant difference in frequency of speech dysfluencies when comparing the two lists of words and non-words (P=0.000). The frequency of speech dysfluency in the list of words was significantly lower than in the list of non-words. Mean, standard deviation, range of frequency of speech dysfluency and P value are presented in Table (1).

Table1. Mean & Standard Deviation of frequency of speech dysfluency in adults with developmental stuttering

Variables	Mean ± SD	Minimum	Maximum	Interval of the Difference	t value	P value
Words	7.79±6.750	0	23	25.506,35.	13.89	0.000
Non-words	38.07±11.750	20	62	065		

Discussion

To our knowledge, this is the first study in Iran that has determined the effect of word meaning on the frequency of speech dysfluency. Authors measured the frequency of speech dysfluency in people who stuttered in reading single words that were either 'words' or 'non-words'. If word meaning was to influence the frequency of speech dysfluency, one would have predicated significantly higher frequency of speech dysfluencies on words than non-words. This hypothesis was not supported by this study, because a greater proportion of speech dysfluencies was observed on non-words than on words. These results are consistent with Hedge and Packman et al.'s study, who documented a higher incidence of speech dysfluencies on sentences comprising non-words when compared to the passage comprising words (27, 28). Moreover, this finding is consistent with Dayalu study that showed an increase in frequency of speech dysfluencies on non-words than words (28). However, in this study the proportion of differences observed in frequency of dysfluencies between non-words and words differed from other studies. In the present study, this proportion was larger when compared to the above-mentioned studies. This could be attributed to differences in stimuli, variation in presentation strategies and contextual and/or speech rate influences during the reading task.

A theoretical model for the occurrence of stuttering moments that is based on differences of stuttering frequency patterns on content and function words (8, 20-23) is a prime example. The proponents of this theoretical construct suggest a phonological difference between these word categories as a contributing factor to the varied frequency of speech dysfluency. However, it nevertheless encompasses the generic issue of word meaning. It can be inferred that the proportion of dysfluency frequency on content words is greater than function words, as content words carry more meaning than function words. Along the same line, it could also be inferred that a higher proportion of dysfluency frequency will be observed on words when compared to non-words. It seems that the strategies used for access, retrieval and execution of words (meaningful words) might be inherently different when compared to non-words (non-meaningful words). Moreover, there are

inherent procedural variations for encoding and decoding words and non-words that can affect the frequency of speech dysfluency.

In non-word reading, the component of semantic content retrieval (word meaning) is missing when compared to word reading. Therefore, non-words need phonological encoding for output. It is logical then that the phonological process of non-word reading is much more complex than of word reading.

Conclusion

In conclusion, this study was the first in Iran to employ a word list. The words and non-words were presented isolation to the adult stutterer. The participants demonstrated a greater proportion of dysfluency frequency on non-words than on words. Further studies on the processing speed for words and non-words in stutterers is warranted, as they might provide additional information on the neuro-linguistic differences in people who stutter and those who don't.

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