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# CO-OCCURRENCES AND FREQUENCY OF DISFLUENCIES IN HUNGARIAN SPONTANEOUS SPEECH

*SUMMARY*

*Speech disfluencies are generally defined as phenomena that interrupt the flow of speech and do not add propositional contents to an utterance. Most spoken disfluencies are not problems in speaking but the solutions to arising problems while speaking. There are various forms of disfluencies like long silent pauses, filled pauses, repeated words, fresh starts, false starts, repairs, prolongations, changes, diverse fillers, slips of the tongue, etc. Spontaneous speech differs not only in the amount and frequency of disfluencies it contains but also in the types that the actual speakers produce. The question arises whether there is any tendency to be traced concerning language-specific (occurrences and) frequency of various types of disfluencies in fluent speech.*

*In this paper we take a closer look at the types, co-occurrences and relative frequency of disfluencies in Hungarian spontaneous speech. The results show that types of uncertainty occur at every 5.47 words in the analyzed material, there are errors at every 33.25 words while there are interruptions at every 10.1 words without silent pauses. The disfluency phenomenon is more speaker-dependent than language dependent. The types and occurrences of these phenopmena are discussed in details in the paper first time for Hungarian.*

***Key words:*** *disfluent speech, spontaneous speech, speech production, Hungarian*

## INTRODUCTION

Speech disfluencies are generally defined as phenomena that interrupt the flow of speech and do not add propositional contents to an utterance (cf. Fox Tree, 1995). There are various forms of disfluencies like long silent pauses, filled pauses, repeated words, fresh starts, false starts, repairs, prolongations, changes, diverse fillers, slips of the tongue, etc. "Erring" was claimed to occur in spontaneous speech no more than once or twice in 1000 words in the sixties (Garnham et al., 1981) while it was estimated ranging from 2 to 26 per 100 words after more than twenty years (Lutz – Mallard, 1986). Repetitions and false starts turned out to be at every 20 words on average (13-33.3 words/informant, cf. Lickley – Bard, 1998). A conservative estimate (excluding silent hesitations) for the rate of disfluencies in spontaneous speech is 6 per 100 words (Fox Tree, 1995). In monologues 3.6 instances of disfluency were found per 100 words while 5.5-8.83/100 words in dialogues (Bortfeld et al., 2001). The frequency estimation depends on several criteria including the problem of silent pauses as well as the actual types of disfluencies considered (Ragsdale – Fry, 1982).

Spontaneous speech varies not only in the amount and frequency of disfluencies it contains but also in the types that the actual speakers produce. The question arises whether there is any tendency to be traced concerning language-specific (occurrences and) frequency of various types of disfluencies in fluent speech. Research in English and German corpora showed mainly similar tendencies in the occurrences of the investigated disfluencies in the two languages (Hieke, 1981). What is interesting is the great difference found in the amount of phonological repairs in English (14.82% of all) against German (5.26% of all), and another difference concerning syntactic errors (cf. 10.53% in German against 18.52% in English). Analyzing self-repairs in Croatian it was found that the most frequent types are morphological and syntactic errors, wrong word retrievals and errors in executing the articulatory program while phonological errors were infrequent (Horga, 1997). Do these results point to the structural differences of these languages or are they merely characteristic of the actual corpora? Disfluencies are supposed to be universal in the sense that they are the consequences of the speech production processes; however, it is possible that not only the speakers' behavior but also the language structure should be taken into consideration when analyzing the phenomenon.

In this paper we take a closer look at the types, co-occurrences and relative frequency of disfluencies in Hungarian spontaneous speech. Our hypothesis was that speakers might differ from each other both (i) in their specific disfluency patterns and (ii) in the frequency and co-occurrences of the actual types. We assumed that the main tendency of frequency will not differ enormously from that found in the literature but we did not exclude the possibility of finding specific occurrences because of the agglutinative character of the Hungarian language.

## METHOD AND MATERIAL

The individual types and occurrences of disfluencies were analyzed on 18 spontaneous speech samples (all narratives). The speakers were 12 females and 6 males, their ages ranged from 22 up to 45 (university students and teachers). They were asked to speak about various topics (like their work, hobby); all of them were aware of being recorded. Their speech was recorded in a sound tight booth at the Kempelen Farkas Speech Research Laboratory of the Linguistics Institute (Hungarian Academy of Sciences). The recorded material was digitized at 10 kHz. Measurements were made by means of the CSL Computerized Speech Lab type 4300B. There was no problem with segmentation of the utterances with any speaker or with any recording when disfluencies or pauses were defined. Silent pauses were set at 100 ms and longer intervals. The total duration of the recorded material was 134.3 minutes, the mean duration of the speakers' narratives was 7.47 minutes (the minimum duration was 5.7 minutes, and the maximum duration was 10.53 minutes). The material contained 15,498 words (the fewest words a speaker produced were 621 while the most were 1450). Means and standard deviations were calculated both for the individual occurrences and for the total material. The statistical evaluation of the data (based on the ANOVA procedure) was carried out in SPSS for Windows 8.0 software package. In all cases confidence level was set at the conventional 95%.

## RESULTS

Disfluencies of spontaneous speech are consequences of disharmony of at-levels or between-levels operations within the speech production process. Speakers are aware of the fact that their speech is randomly interrupted by either controlled or uncontrolled errors. However, they are not aware of the frequency and types of disfluencies they produce during speaking. They even do not realize a lot of interruptions they make in their spontaneous speech. The next two paragraphs are cut from longer spontaneous narratives spoken by female speakers. In the texts below, all disfluencies are marked by bold letters, hesitation is shown by **öö** and **hm**. Double **aa** refers to prolongation of the Hungarian definite article. In the 107 words of the first text sample there are 40 disfluencies: 17 silent pauses, 9 hesitations, two fillers, 5 syntactic errors, one restart, 3 slips, 2 prolongations, one repetition, and one pause within a compound word. The second sample consists of 23 words where there are 21 disfluencies: 12 silent pauses, 5 hesitations, 3 prolongations, a restart and one pause within a word.

Sample 1: "**aa** következő műsorszámunknak az el**őő pause** (86 ms) adónője megkért **pause** (125 ms) hogy egy néhány szóban ismertessem és magyarázzam meg **aa pause** (520) műsorát **pause** (486 ms) ugyanis ő hastáncot fog **pause** (393 ms) **öö** (210 ms) bemutatni **pause** (242 ms) **öö** (126 ms) érdekes lehet hogy hogy jön ide **pause** (346 ms) **a hogy jön** a hipnózis találkozó**hozs**

**találkozóhoz** a hastánc a **pause** (398 ms) **hm** (261 ms) **öö** (299 ms) **pause** (141 ms) a hastáncnak sokféle **pause** (447 ms) neve van a francia gyomortánctól kezdve **pause** (495 ms) **aa** (447 ms) a görög úgyneve**zsett** ciftetel**li pause** (338 ms) ami egy török ritmusnak a ne**ve pause (480 ms) öö** (468 ms) **nevén** keresztül a Közel-Keleten ahol dance orientale **pause** (130 ms) **tehát** keleti táncnak **öö** (500 ms) nevezik **pause** (204 ms) a lényeg az **pause** (126 ms) hogy mindegyik **öö (899 ms)** kifejezés valahogy utal **arra hogy egyrészt** a mozgásra magára **pause** (345 ms) másrészt pedig arra hogy honnan indu**lt pause** (266 ms) **tehát öö** (379 ms) a keletről **indul** ez a **öö** (379 ms) **pause** (105 ms) tánc"

Sample 2: "én a magyar jelnyelv **pause** (811 ms) **öö** (348 ms) jeleit próbálom meg **pause** (355 ms) e**szerint pause** (219) **öö** (335 ms) **pause** (207 ms) az elmélet szerint **pause** (248 ms) **öö** (276 ms) **pause** (49 ms) osztályozni **pause** (96 ms) a kutatásom **pause** (120 ms) jelenlegi fázisában (653 ms) **öö** (593 ms) **pause** (247 ms) a szótárnak **aa** hétszázö**t öö** (128 ms) **v**en jele van feldolgozva **pause** (134 ms) illetve ezek közül **aa pause** (82 ms) kétkezes jelek"

Speakers as listeners learn – presumably during language acquisition – to handle disfluencies. This is the same problem as how children acquire the acoustic structures of various realizations of the phonemes, sound sequences of their native language as produced by children, females, males of various ages, in different contexts, under different circumstances and in diverse communications situations. They are supposed either to learn differences of their native language or they will learn the similarities. In the first case they ignore the insignificant or irrelevant features while in the other case they try to extract the familiar, recurring features and will focus on them. The same process should work in order to decode disfluencies as certain portions of speech. Children either have to ignore them when processing speech comprehension at a very early level of the mechanism or, they learn to use them as opportunities for a better processing of decoding. It is argued that a certain amount of disfluencies does not disturb the speech decoding mechanism, moreover it helps the listeners by providing more time for processing speech comprehension (Fox Tree, 2001; for Hungarian: Gósy, 2001).

Though everybody seems to know the nature of the disfluency phenomenon, there are various labellings for the various types and there is no agreement about some categorization of them. 'Hesitation' for example, either covers filled pauses or both silent and filled pauses or it is claimed that it "marks critical points in processing" (Hieke, 1981:147) and so it refers to silent and filled pauses, repeats and false starts. The label "vocal hesitations" additionally includes sentence change, omission, intruding incoherent sounds or even tongue slip (Ragsdale–Fry, 1982). According to our former investigations (Gósy, 2002), 18 types of disfluencies were defined in advance to be sought in the material; however, 2 of them could not be found with certainty: Freudian slip and the tip-of-the-tongue phenomenon. There was only one occurrence of malapropism, therefore it did not appear in further analysis. Disfluencies were categorized according to their nature – whether they refer (i) to 'uncertainty' of the speaker

about what to say next or (ii) to 'errors' produced by the speaker. The main difference between these two categories lies in the place of their appearance in the speech production process. Disfluency types referring to uncertainty appear when converting ideas into linguistic form (i. e. between concepts and grammatical planning or between concepts and activation of the mental lexicon) while errors may appear anywhere at various levels or between levels of the process. The types of the category 'uncertainty' are silent pauses, hesitations (or filled pauses), repetitions and fillers (filler words, or "verbal garbage" as they are called by Fox Tree–Schrock 2002) while the types of 'errors' show diverse forms such as grammatical errors (morphological, syntactic), contaminations, restarts, restarts with change of affix, false starts, word retrieval problems (WRP) including both word finding/selection difficulty (that appears in changing the uttered word or producing a false word) as well as the tip-of-the-tongue phenomenon, phonological errors (assimilations), prolongations, pauses within words, errors of articulation planning, and simple slips of the tongue. All of these were analyzed according to each speaker. Two subtypes of restarts were differentiated that are relevant for Hungarian. Apart from the "classical" restarts when shorter or longer parts of a word are uttered but not completed and the speaker utters the same word again from the beginning, in our material there were also restarts where the speaker altered the suffix or added a new suffix to the formerly uttered word. In Figure 1 disfluencies are listed according to their supposed place within the speech production mechanism while Table 1 summarizes examples for the types except for obvious silent pauses and repetitions.

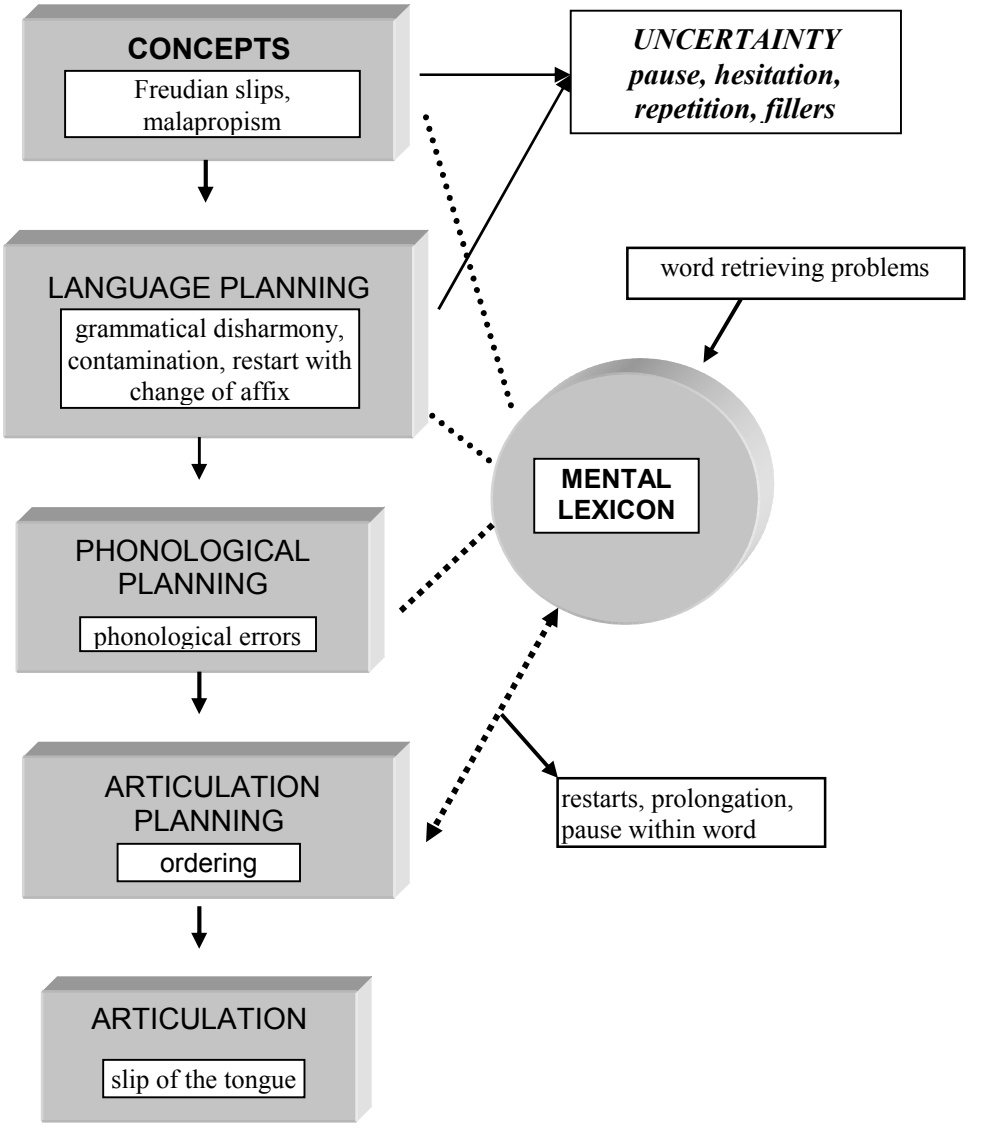


**Figure 1.** The speech production process with the places of types of disfluency.

**Slika 1.** Govorna proizvodnja s lokalizacijom tipova nefluentnosti.

**Table 1.** Disfluency types and Hungarian examples.
**Tablica 1.** Tipovi nefluentnosti i primjeri u mađarskom.

| Disfluency type<br>Tip nefluentnosti | Hungarian example<br>Primjer u mađarskom | English equivalents/glosses<br>Engleski ekvivalent |
|---|---|---|
| hesitation<br>oklijevanje | [ø] or [ø:] or [m:] or [hm] or [khm] | uhm, um, uh |
| contamination<br>kontaminacija | a kezében forgatni a könyvet<br>(i) kez(é)be venni vs. (ii) forgatni | peruse the book in his hand (i)<br>take in his hand vs. (ii) peruse |
| phonological<br>fonološka pogreška | azban (abban) | imit (in it) |
| prolongation<br>duljenje | kkülönböző; dee; aaz | ddifferent; buut; thaat |
| slip of the tongue<br>govorna pogreška | találkozóhozs pause találkozóhoz;<br>györs gyorsírók | for a dape … for a date; shirt … shorthanders |
| serial order error<br>pogreška u poretku | gyeke gyerekeim;<br>süti a víz a napot (cf. a nap a vizet) | my di … my kids; water is shining on the sun |
| syntactic error<br>sintaktička pogreška | párhuzam az akkori országról (cf. országgal); gyanítok valami eltérésre (cf. eltérést); a legkevesebb ilyen elemeket (cf. elemet) | a parallel on the country then (with the country); I suspect at a difference (suspect a difference); the fewest such item (items) |
| pause<br>within a word<br>stanka unutar riječi | har (pause) madik<br>zenér (pause) ről | thi (pause) rd;<br>music (pause) about |
| false word activation<br>aktivacija pogrešne riječi | lehetséges indokot (cf. okot);<br>európai lendület ... rendelet | possible reason (cf. cause);<br>European swing … decree |
| filler / poštapalica | tehát; ugye; szóval;<br>tulajdonképpen | I mean, you know |
| restart<br>ponovno započinjanje | ritm ritmus; any anyagi;<br>ro rossz | rhy … rhythm; mat … material;<br>ba … bad |
| restart with change of affix<br>ponovno započinjanje s promjenom afiksa | testrésznek pause testrésszel;<br>gyűjteményt pause gyűjteménynek | for body part (pause) with body part; collection – acc. (pause) with collection |
| change of word<br>promjena riječi | különböző helyei pause tájai;<br>a történelmi pause anyanyelvi nevelés | various places (pause) regions;<br>history (pause) mother-tongue education |
| false start<br>pogrešno započinjanje | már okt pause novemberben;<br>italokat ára pause áruló;<br>ez tifi tipikusan | already in Oct (pause) November;<br>sella (pause) selling drinks; this tyfi … typically |

Disfluencies defined as uncertainty types are more frequent than the actual errors; however, there are relatively large differences among speakers. The mean value of uncertainty types in percentage is 2.3537 (std. dev.: 1.201) while the mean value of error types is 0.262 (std. dev.: 0.172) of the total

material. Table 2 shows the occurrences of disfluency types from the aspect of speakers, mean and standard deviation values. (100% in column labeled 'occurrence across speakers' means that the actual type of disfluency appeared with all subjects, i.e. 18 speakers. The two other columns show the percentages of the types depending on the total number of words in the analyzed material.)

**Table 2.** Descriptive statistical data of occurrences of disfluencies.
**Tablica 2.** Rezultati deskriptivne statistike o pojavljivanju nefluentnosti.

| Disfluency type<br>Tip nefluentnosti | Occurrence across speakers (%)<br>Pojavljivanje prema govornicima (%) | Mean (%)<br>Prosjek (%) | Standard deviation<br>Standardna devijacija |
|---|---|---|---|
| phonological<br>fonološka pogreška | 11.1 | 0.012 | 0.036 |
| hesitation<br>oklijevanje | 100 | 4.397 | 2.84 |
| repetition<br>ponavljanje | 83.3 | 1.08 | 1.16 |
| contamination<br>kontaminacija | 22.2 | 0.025 | 0.05 |
| prolongation<br>duljenje | 83.3 | 0.889 | 0.88 |
| slip of the tongue<br>govorna pogreška | 50 | 0.141 | 0.186 |
| serial order slip<br>pogreška u poretku | 66.7 | 0.172 | 0.177 |
| syntactic error<br>sintaktička pogreška | 88.9 | 0.626 | 0.55 |
| silent pause<br>bezvučna stanka | 100 | 11.34 | 2.66 |
| silent pause<br>within a word<br>bezvučna stanka unutar riječi | 72.2 | 0.429 | 0.718 |
| false start<br>pogrešno započinjanje | 83.3 | 0.364 | 0.257 |
| false word activation<br>aktivacija pogrešne riječi | 38.9 | 0.071 | 0.10 |
| filler<br>poštapalica | 94.4 | 1.58 | 1.46 |
| restart<br>ponovno započinjanje | 100 | 0.47 | 0.31 |
| restart with change of affix<br>ponovno započinjanje s promjenom afiksa | 61.1 | 0.191 | 0.21 |
| change of word<br>promjena riječi | 55.6 | 0.124 | 0.16 |

The occurrence of the types of disfluencies was supposed to be unbalanced. Data confirmed the hypothesis. Concerning the total material, 69.59% of all disfluencies turned out to be cases of uncertainty while 30.41% belonged to the error category (silent pauses were excluded from these calculations). Statistical analysis revealed that there are significant differences among the various types of disfluencies in our material (using the Friedman-test: $\chi^2$ (15) = 172,918, $p < 0.01$). The differences between the types of 'uncertainty' and 'error' proved to be significant as well (Wilcoxon Signed Ranks Test Z = -3,724, $p < 0.01$).

The greatest problem the speaker comes across appears when the concept should be expressed into linguistic forms. Here, the uncertainty types cover 69.59% of all disfluencies (out of this amount filled pauses cover 59.33%, fillers 23.24% and repeats 17.43%). The next place of the process where breaks in speech fluency may arise lies between articulation planning and activation of the mental lexicon. The amount of disfluencies here is 18.39%. Grammatical planning causes relatively grave problems resulting in 7.04% of all interruptions while articulation planning and the activation of the mental lexicon involve fewer difficulties (cf. 2.93% and 1.89%). In the present material 0.06% of all disfluencies were found at the level of concept and 0.1% concerning phonological planning. We can conclude that speakers have a lot more difficulties at the beginning of the speech production process while they encounter relatively fewer problems close to the actual articulation.

The individual differences reveal that there are speakers who are more uncertain when producing spontaneous speech but they do not commit many errors, others exhibit a similar amount of the two types of disfluencies but uncertainties are always dominating while a third part of the speakers had almost no difference between these two types (Figure 2). With the majority of speakers (2/3 of them) types of uncertainty exceeds errors by 1 to 4%. There was one case when the difference exceeded 7% and two cases where there was no difference or only 0.5%. In our material there was only one speaker who had more errors than uncertainties. Statistical analysis confirmed that the frequency of occurrences were different with our speakers (F(56.905), p=0.000, F(99.309), p=0.000).

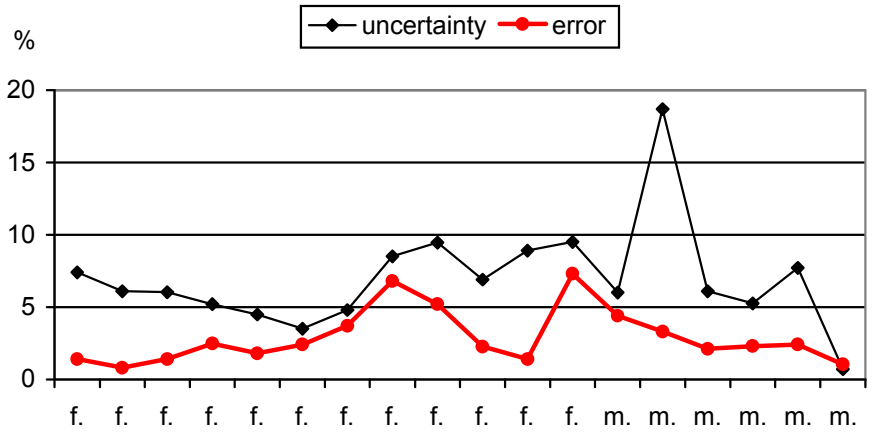


**Figure 2.** Occurrences of uncertainties and errors with the speakers individually (f = female, m = male),
**Slika 2.** Pojavljivanje nesigurnosti i pogrešaka kod svakog ispitanika. (f=žene, m=muškarci)

The speech tempo of the speakers was defined (and expressed in words/minute) and three tempo categories were defined: slow, moderate and fast. All subjects were grouped according to their tempo (Table 3). Our assumption was that the speech production tempo has got some interrelation with the frequency of disfluencies, more precisely the slower tempo was supposed to show more control over speech characterized by fewer interruptions.

**Table 3.** Speech tempi of the 18 speakers.
**Tablica 3.** Tempo govora za 18 govornika.

| Speech tempo<br>Tempo govora | Mean values (words/min)<br>Prosječna vrijednost (riječi/min) | Range of values (words/min)<br>Raspon rezultata (riječi/min) | Number of speakers<br>Broj govornika |
|---|---|---|---|
| slow / spor | 125.28 | 114-130 | 7 |
| moderate / umjeren | 138 | 136-140 | 7 |
| fast / brz | 156 | 150-160 | 4 |

The mean speech tempo of all speakers was 10.9 sounds/s. All speakers had filled pauses independently of their speech tempo. The question arises whether these pauses are different between slower and faster speakers. Neither the non-parametric Kruskal Wallis Test nor ANOVA confirmed a significant difference of filled pauses depending on speech tempo. However, there is a clear

tendency suggesting that speech tempo slightly influences disfluencies. Data show that the 'extreme' speakers – the ones who speak too slowly or too fast – seem to have more interrupted spontaneous speech than those with a moderate speech tempo (Figure 3). The impact of speech tempo was supported by analyzing English-speaking subjects as well (Shriberg, 2001). The slower speakers took more time to plan therefore hesitations and repetitions increased in their speech (157).

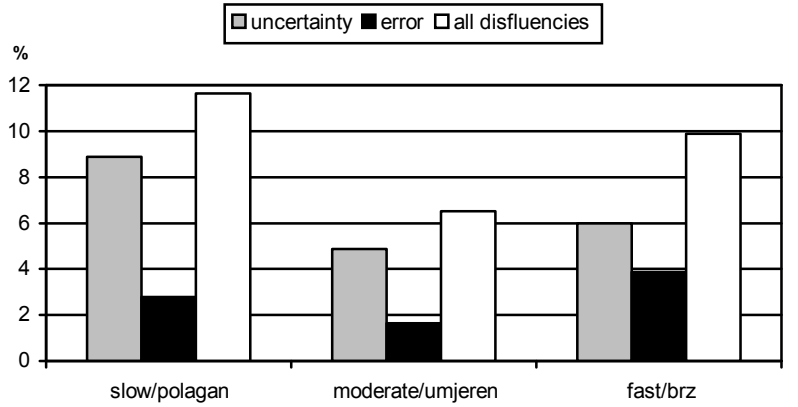


**Figure 3**. Interrelations of speech tempi and disfluencies.
**Slika 3.** Povezanost tempa govora i nefluentnosti.

Disfluencies can be classified according to their frequency in spontaneous speech. Five categories could be defined. Data with disfluency types that speakers did produce were categorized into five groups based on the $25^{th}$, $50^{th}$ and $75^{th}$ percentiles (with each group containing approximately the same number of cases). Results show that 30.6% of all possible disfluencies fall into the category labeled as 'subjects did not produce', 17.7% fall into the category labeled as 'subjects produced extraordinary rarely', 16.7% fall into the category labeled as 'subjects produced very infrequently', 17.7% fall into the category labeled as 'subjects produced rarely' and 17.4% fall into the category labeled as 'subjects produced frequently'. Three types were found with all speakers, they are: (silent) pause, hesitation (filled pause) and restart. The most infrequent ones are: phonological errors, contaminations and slips. The least number of disfluencies speakers show was eight while the highest number found was fifteen. Seven subjects (about 40% of all speakers) produced 11 or 12 types; and five subjects had 9 different disfluencies.

Pauses serve many functions in fluent speech. Beside those that are the results of various kinds of disharmony between speech planning and articulation, there are well-known factors resulting in silent pauses: (i) breathing, (ii) intention of interpretation of the text, (iii) pauses determined by syntax, emotion,

rhetorical and expressive emphasis, stylistic properties. It is quite possible that any one particular pause might serve more than one function. So, silent pauses are multifunctional and their occurrences and durations are different across speakers. Silent pauses do not mean disharmony without doubt on the one hand and it is not obvious whether the speaker anticipated the pause or not, on the other hand. More recent literature suggests that Japanese speech contains pauses 25% of the time, 24.5%-53% of French political speeches are made up by pauses, while in dialogues pauses appeared in 32% of all speaking time (Misono and Kiritani, 1990; Duez, 1982). In our material there were 1763 places of silent pauses (longer than 100 ms) which is 11.37% of the total material. Goldman-Eisler suggests that silent pauses occur roughly every seven to eight words in everyday communication (1968). Our data roughly confirmed her estimation for it turned out to appear every 8.79 words. Filled pauses, however, are always signal marks of the actual disharmony of the speaker's speech production process. The occurrences are shown in Figure 4. The fewest silent pauses could be detected with a male speaker showing 6.08% pauses of his speech sample while the ratio of most numerous pauses was 16.38% (one of the female speakers).

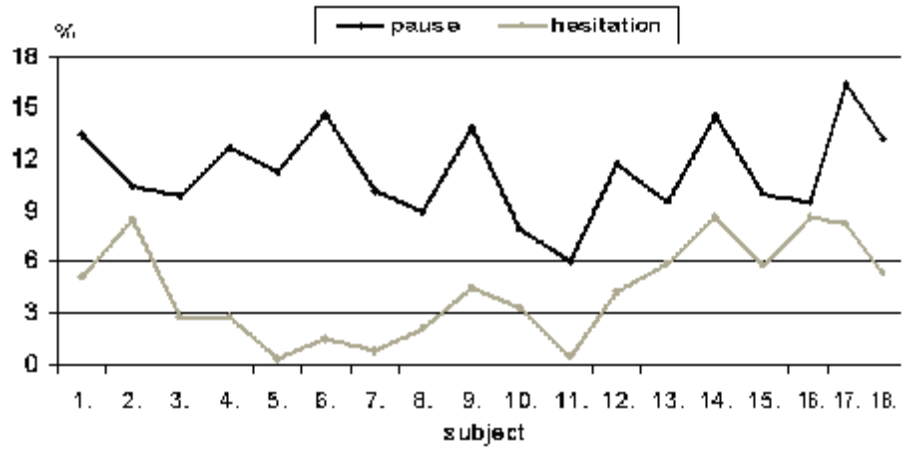


**Figure 4.** Silent and filled pauses of all speakers.
**Slika 4.** Bezvučne i zvučne stanke svih govornika.

The ratio of error types to one another shows that the most frequent problems concern the actual syntactic and morphological planning of concept as well as the activation of the mental lexicon (cf. Figure 5). This is supported by the relatively frequent occurrence of prolongations (24.03%) but it is hard to decide about the actual source of the speakers' troubles. Prolongations appeared mostly on the vowel of the Hungarian definite articles (*a, az*) with all speakers. Our speakers violated Hungarian grammatical structures in 20% of all error

disfluencies that reveals the greatest disharmony between conceptualization and language forms within the speech production process. Similar ratio was detected, however, with word activation which was seizable by the relatively great amount of restarts (19.8%), false starts (10.38%) and word change (3.46%) as well. In the literature very little can be read about pauses appearing within a word. In our material this type of disfluency covered again a large proportion (10.38%) which seems to be a language-specific characteristics in relation to the rich morphology and to the many compound words of Hungarian. Pauses occurring at the boundary of the two parts of a compound could be defined as an activation problem while those before suffixes are the outcomes of the morphological planning difficulties. Examples: belep (244 ms) pillantottam 'into it … I glanced', nyelv (48 ms) vészet 'ling … guistics', réteg (50 ms) ben 'in … a layer', amelyek (340 ms) nek 'for … which', ízlés (168 ms) normának 'to a task … norm', válság (452 ms) hullám 'crisis … after crisis'.

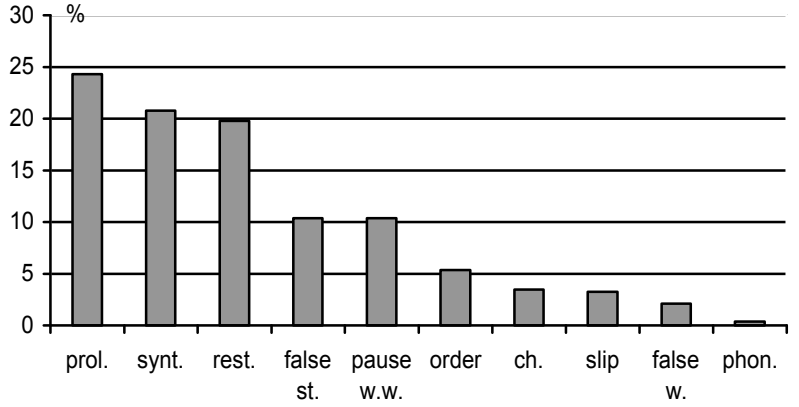


**Figure 5.** Occurrences of error types in the total material.
(prol. = prolongations, synt. = syntactic error, rest. = restarts, false st. = false starts, pause w.w. = pause within word, order = serial order error, ch. = change, slip = slip of the tongue, false w. = false word, phon. = phonological error).

**Slika 5.** Učestalost tipova pogrešaka u cijelom materijalu.
(prol .= duljenje, synt. = sintaktička pogreška, rest. = ponovno započinjanje, st.=pogrešno započinjanje, pause w.w.=stanka unutar riječi, order=pogreška u poretku, ch.=promjena, slip=govorna pogreška, false w.=pogrešna riječ, phon.=fonološka pogreška).

Correlations (Spearman correlation coefficients) were calculated in order to highlight the co-occurrences of certain types if any. The strongest positive correlation was found between pauses within word and prolongations while moderate positive correlations were found with various disfluencies

(summarized in Table 4). (Pauses are excluded from the table but show correlation with serial order errors [.538, p=.021]).

**Table 4.** Matrix of significant correlation data among certain types of disfluencies (Abbreviations: c. = Spearman's rho value for a certain pair of disfluency types, s. = probability levels obtained for the correlation coefficient; prol. = prolongations, synt. = syntactic error, rest. = restarts, false st. = false starts, p. w. = pause within word, ord. = serial order error, ch. = change, slip = slip of the tongue, false w. = false word activation, fil. = fillers, hes. = hesitation, rep. = repetition).

**Tablica 4.** Matrica značajnih koeficijenata korelacija između određenih tipova nefluentnosti. (Kratice: c. = Spearmanova ro vrijednost za određeni tip nefluentnosti, s. = vjerojatnost za koeficijent korelacije, prol. = duljenje, synt. = sintaktička pogreška, rest. = ponovno započinjanje, false st. = pogrešno započinjanje, p.w. = stanka unutar riječi, ord. = pogreška u poretku, ch. = promjena, slip = govorna pogreška, false w. = aktivacija pogrešne riječi, fil. = poštapalica, hes. = oklijevanje, rep. = ponavljanje).

| | | hes. | rep. | fil. | synt. | rest. | false w. | ch. | prol. | p.w. | ord. | slip | false st. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hes. | c. | | | | | | | | | .652 | | | |
| | s. | | | | | | | | | .015 | | | |
| rep. | c. | | | .671 | .484 | .560 | | | | | | | |
| | s. | | | .002 | .042 | .016 | | | | | | | |
| fil. | c. | | .671 | | .667 | | | | | | | | .586 |
| | s. | | .002 | | .002 | | | | | | | | .011 |
| synt. | c. | | .484 | .667 | | | .513 | | | | | | |
| | s. | | .042 | .002 | | | .029 | | | | | | |
| rest. | c. | | .560 | | | | | .502 | | .569 | | | |
| | s. | | .016 | | | | | .034 | | .014 | | | |
| false w. | c. | | | | .513 | | | | | | | | |
| | s. | | | | .029 | | | | | | | | |
| ch. | c. | | | | | .502 | | | | | | | |
| | s. | | | | | .034 | | | | | | | |
| prol. | c. | | | | | | | | | .808 | | | |
| | s. | | | | | | | | | .000 | | | |
| p.w. | c. | .562 | | | | .569 | | | .808 | | | | |
| | s. | .015 | | | | .014 | | | .000 | | | | |
| ord. | c. | | | | | | | | | | | .689 | |
| | s. | | | | | | | | | | | .002 | |
| slip | c. | | | | | .742 | | | | | .689 | | |
| | s. | | | | | .000 | | | | | .002 | | |
| false st. | c. | | .515 | .589 | .562 | | | | | | | | |
| | s. | | .029 | .011 | .015 | | | | | | | | |

Analyzing the correlation results it is obvious that the largest number of interrelations take place between uncertainties and actual errors. There are a few cases of linear relationship within the error types and only one could be found within the types of uncertainty (between repetitions and fillers). This means that those who show much uncertainty while speaking will also commit errors frequently. Slips are closely connected with restarts while pauses appearing within a word are connected with prolongations. The former can be explained by the relatively long route of the process between language planning and actual articulation. The latter shows that word activation problems can either appear as prolongations or as interruptions at a certain moment of word articulation.

Listening to speakers' speech in everyday communication one feels that there are disfluency types people seem to prefer. Analyzing our data from this aspect it turned out that there really are types preferred over others (cf. Table 5). Speakers prefer disfluencies appearing in the columns of the table to those in the rows of the table.

**Table 5.** Preferred disfluencies (based on significant differences obtained with a Nemenyi test). (Abbreviations: prol. = prolongations, synt. = syntactic error, p. w. = pause within word, phon. = phonological error, ord. = serial order error, slip = slip of the tongue, false w. = false word activation, hes. = hesitation, rep. = repetition, cont. = contamination).

**Tablica 5.** Učestalije nefluentnosti (temeljeno na značajnim razlikama prema Nemenyi testu). (Kratice: prol. = duljenje, synt. = sintaktička pogreška, p.w. = stanka unutar riječi, phon. = fonološka pogreška, ord. = pogreška u poretku, slip = govorna pogreška, false w. = aktivacija pogrešne riječi, hes. = oklijevanje, rep. = ponavljanje, cont. = kontaminacija).

| Type | synt. | restart | prol. | rep. | filler | hes. | pause |
|---|---|---|---|---|---|---|---|
| **phon.** | 7.722 | 7.889 | 8.444 | 8.611 | 10.278 | 13.056 | 14.667 |
| **cont.** | | 7.444 | 8.000 | 8.167 | 9.833 | 12.611 | 14.222 |
| **false w.** | | | | | 8.667 | 11.444 | 13.056 |
| **slip** | | | | | 7.778 | 10556 | 12.167 |
| **change** | | | | | 7.722 | 10.500 | 12.111 |
| **restart** | | | | | | 9.444 | 11.056 |
| **ord.** | | | | | | 9.333 | 10.944 |
| **p. w.** | | | | | | | 8.778 |
| **false start** | | | | | | | 8.222 |

The tendency is clear, speakers use first of all silent and filled pauses as well as fillers in order to escape from planning troubles. Repetitions, restarts and prolongations of the first sound of a word are more "popular" than for example

false starts, slips or selecting false words. The co-occurrences of these phenomena show speaker dependence as Figure 5 shows with six speakers selected randomly out of the 18.

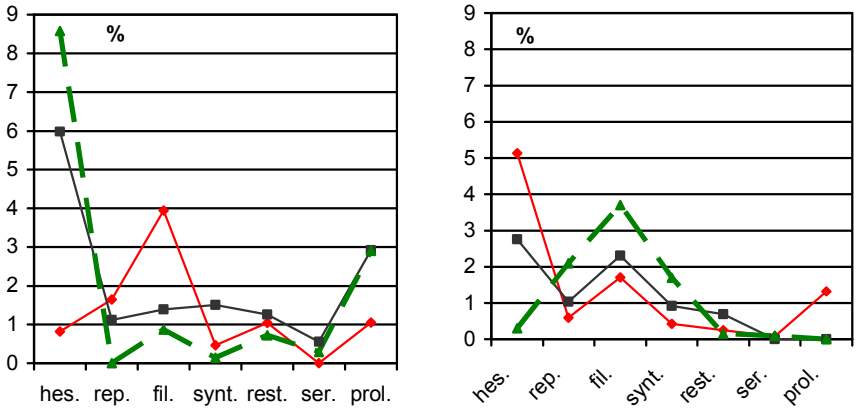


**Figure 6.** The occurrences of disfluencies with 6 speakers.
**Slika 6.** Pojavljivanje nefluentnosti kod 6 ispitanika.

Though there were 12 females and only 6 males among our speakers, we analyzed the disfluency rates and types depending on sex. Results show that females' spontaneous speech is characterized by fewer occurrences of uncertainty compared to the data of the males while there is no real difference between them in the occurrence of errors. The standard deviation values, however, are higher with males concerning uncertainties and with females concerning errors (Table 6). The differences, however, are not significant (2-tailed t-test). English-speaking men also made more disfluencies than did women (cf. Shriberg, 2001).

**Table 6.** Differences between females and males.
**Tablica 6.** Razlike po spolu.

| Speakers | Uncertainty/Nesigurnost (%) | | Errors/Pogreške (%) | |
|---|---|---|---|---|
| Govornici | mean/prosjek | std. dev. | mean/prosjek | std. dev. |
| females/žene | 6.87 | 1.95 | 3.58 | 2.23 |
| males/muškarci | 7.43 | 5.96 | 3.37 | 1.51 |

## DISCUSSION

Our data do not differ enormously from those found in the literature. The present material shows types of uncertainty at every 5.47 words, there are errors at every 33.25 words while there are interruptions – independently of the source and place – at every 10.109 words without silent pauses. Disfluency phenomena are more speaker-dependent than language dependent; however, there are clear differences that should obviously be explained by the different language structures like the occurrence of phonological errors. Most spoken disfluencies, as it is agreed, are not problems *in* speaking but the solutions to problems arising *while* speaking. The speaker, however, has a variety of strategies for preventing and solving these problems, as well as controlling his speech in order to achieve synchronization at each level of the mechanism. Delays and various possibilities of disharmony are unavoidable, and speakers have many choices about how to handle them. There are no "rules" for handling a disharmony. Every speaker has to develop a specific battery of things to do when the problem comes. The consequence of this individual battery is that a speaker can be characterized by his disfluencies and by their frequency, that is, by the "interruption scale" of his speech. Struggle with transforming concepts into grammatical forms results in more disfluencies than producing the correct lexical units along the speech production process. Problems arising between concepts and grammatical encoding (including the activation of the mental lexicon) was defined as 'uncertainties' while those problems occurring elsewhere in the process were called 'errors'. Types of uncertainties are significantly more frequent than types of what are called errors. There are only three disfluencies that could be detected with all speakers: (silent) pause, hesitation (filled pause) and restart. It is obvious that silent and filled pauses and restarts are supposed to occur at two different times of the process. Pauses are likely to appear first of all before grammatical planning while restarts are some kinds of corrections, and are supposed to appear before articulation planning. This means that all speakers come across planning problems but not all of them have trouble with other tasks of encoding. The speaker-dependency of disfluencies can be understood as a set of windows on various strategies and batteries of preventive methods that speakers employ during speaking.

As we have seen, disfluencies are similar across speakers; however, their effects on listeners heavily depend on the type, occurrence and placement of interruptions. Experimental data showed that listeners judged speakers producing frequent pauses and hesitations to be less honest, less comfortable with the actual topic and to have more production difficulty (Fox Tree–Schrock, 2002). The errors made in spontaneous speech can be repaired and unrepaired, where the latter case might result in further problems for listeners and more complex re-editing procedure while listening and comprehending.

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## VREMENSKO POKLAPANJE I UČESTALOST NETEČNOSTI U MAĐARSKOM SPONTANOM GOVORU

*SAŽETAK*

*Govorne netečnosti općenito su definirane kao fenomeni koji prekidaju govorni niz i ne unose dodatni sadržaj u izraz. Većina govornih netečnosti nisu problemi u govoru nego rješenja problema koji se pojavljuju pri govoru. Različite su vrste govornih netečnosti, npr. duge tihe pauze, ispunjene pauze, ponovljene riječi, novi počeci, lažni počeci, ispravke, produženja, izmjene, različiti umeci, pogreške u govoru itd. Spontani se govor razlikuje ne samo po količini i učestalosti netečnosti koje sadrži, nego i po vrstama koje određeni govornik rabi. Postavlja se pitanje postoji li tendencija određenih govorno specifičnih (pojavnosti i) učestalosti različitih vrsta netečnosti u tečnom govoru koje treba promatrati.*

*U ovom radu pobliže promatramo vrste, vremenska poklapanja i relativnu učestalost netečnosti u mađarskom spontanom govoru. Rezultati pokazuju da se neke vrste nesigurnosti pojavljaju u svakih 5.47 riječi u analiziranom materijalu, da se greške pojavljuju u svakih 33.25 riječi te da su prekidi bez tihih pauza prisutni nakon svakih 10.1 riječi. Fenomen netečnosti više ovisi o govorniku nego o jeziku. U ovom se radu prvi put detaljnije govori o vrstama i pojavnosti ovih fenomena u mađarskom.*

***Ključne riječi:*** *nefluentni govor, spontani govor, govorna produkcija, mađarski jezik*