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LINGUISTIC DISFLUENCY IN CHILDREN DISCOURSE: LANGUAGE LIMITATIONS OR EXECUTIVE STRATEGY?

Balčiūnienė I. (i.balciuniene@hmf.vdu.lt)^{1,2},

Kornev A. N. (k1949@yandex.ru)¹

¹Vytautas Magnus University, Kaunas, Lithuania

²Saint-Petersburg State Pediatric Medical University, Saint-Petersburg, Russia

The paper deals with linguistic disfluencies (hesitations, repetitions, revisions, false starts, and incomplete utterances) in Russian-speaking language-impaired (N=12) vs. typically-developing (N=12) preschoolers. The corpus-based study aimed at evaluation and comparison of linguistic disfluency in narrative vs. dialogue discourse within and between the groups. Following the *Russian Assessment Instrument for Narrative* (RAIN) methodology, each subject performed two tasks, i.e. storytelling and story retelling according wordless picture sequences; each of the tasks was followed by a structured dialogue based on ten comprehension questions. Both narratives and dialogues were transcribed and annotated for automatized linguistic analysis. Finally, individual measures (a number of each category of disfluencies per utterance) were estimated and submitted for statistical analysis.

Results of our study evidenced that mainly linguistic disfluencies are caused by distinct strategies of speech production due to a level of the subject's language competence, cognitive resource, and the circumstances of narrative and dialogue production.

Keywords: narrative, conversation, corpus-based data, linguistic disfluency

НАРУШЕНИЯ ПЛАВНОСТИ РЕЧЕВОГО АКТА У ДЕТЕЙ: РЕЧЕВАЯ ДИСФУНКЦИЯ ИЛИ СТРАТЕГИЯ АУТОМОНИТОРИНГА?

Балчиюниене И. (i.balciuniene@hmf.vdu.lt)^{1,2},
Корнев А. Н. (k1949@yandex.ru)¹

¹Санкт-Петербургский государственный педиатрический медицинский университет, Санкт-Петербург, Россия

²Университет Vytautas Magnus, Каунас, Литва

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1. Introduction

Speech disfluency can generally be distinguished as being either stuttering or linguistic disfluency. The second one contains hesitations, repetitions, revisions, false starts, incomplete utterances, etc. (Loban, 1976; MacLachlan, Chapman, 1988). Linguistic disfluencies seem to be quite natural elements of spontaneous speech in adults (Akkutina, 1989; Fromkin, 1971; Garrett, 1980; Bock, Levelt, 1994; Kibrik, Podlesskaya, 2007) and typically developing (TD) children (Culatta, Leeper, 1989–1990). Some data evidenced that the age might influence a number of disfluencies: its amount increases along the speaker's age (Evans, 1985; Bortfeld et al., 2001; Gyarmathy, Neuberger, 2013) and growing linguistic skills (Fiestas et al., 2005). As Starkweather (1987) has stated, with developing syntax and increasing vocabulary, utterances become longer and linguistically (structurally and semantically) more complex, theoretically making it more difficult to plan a speech. However, here are some opposite observations that child discourse might be more disfluent than the adult one (Garmash, 1999; McDaniel et al., 2010a; 2010b).

Linguistic disfluency has been investigated in various atypically-developing (Culatta, Leeper, 1989–1990; Redmond, 2004; Sieff, Hooymann, 2006; Engelhardt et al., 2010; Steinberg et al., 2013) and specifically language-impaired (SLI)¹ populations (Boscolo et al., 2002; Madon, 2007; Gou et al., 2008). Results of the studies have highlighted that children with language and learning difficulties tend to use more linguistic disfluencies than do their TD peers (Guo et al., 2008). To sum up, a great number of linguistic disfluencies might be a symptom of atypical language acquisition; on the other hand, production of linguistic disfluencies might be treated as natural component of non-prepared, spontaneous discourse (Schegloff et al., 1977; Akkutina, 1989;

¹ In Russian logopaedics, specific language impairment (SLI) in children usually is named as the *primary speech and language disorder*.

Fromkin, 1971; Garrett, 1980; Levelt, 1983; 1984; Bock, Levelt, 1994; Postma, 2000; Pillai 2002; Bekenstein, Simpson, 2003; Fox Tree, 2007a; Kibrik, Podlesskaya, 2007; Hennemann, 2015), where a self-monitoring performs a crucial role.

Despite numerous studies, substantially a nature and mechanisms of linguistic disfluency however remain unclear both in children and adults. According psycholinguistic approach, linguistic disfluency might be recognized as a concordance problem between utterance programming, related speech production and on-line self-monitoring (Gyarmathy, Neuberger, 2013), different underlying production problems or strategies for correcting problems. In some studies, a correlation between linguistic disfluency production, individual intelligence, and executive function (Engelhardt et al., 2010; 2013) has been revealed. A number of studies in child language (MacLachlan, Chapman, 1988; Leadholm, Miller, 1992; Wagner et al., 2000; Madon 2007) have confirmed that linguistics disfluencies are more numerous in a narrative than in a conversation, because the narrative context is usually more demanding than the conversational one.

It should be noted that the majority of studies have been focused on just particular type of linguistic disfluencies, e.g. hesitations (Fox Tree, 2007a; 2007b; Corley, Stewart, 2008) or revisions and self-repairs (Levelt, 1983; 1984; Evans 1985; Bekenstein, Simpson, 2003). In this paper, we aim at discussing linguistic disfluencies as the entity of various kinds of disruptions of linguistically fluent speech. In some studies, an influence of the discourse genre on a frequency of dysfluencies has been found. A narrative might be recognized as a high cognitive loading type of discourse, while a dialog seems less planning demanded. In our corpus-based study, these discourse types were compared from the perspective of disfluency production.

Research questions addressed in the paper:

1. How does a frequency and distribution of linguistic disfluencies distinct between typically developing (TD) and specifically language-impaired (SLI) children?
2. How does a frequency and distribution of linguistic disfluencies distinct between different discourse genres, i.e. child narrative vs. structured dialogue with an adult?

2. Types of Linguistic Disfluencies

In our data, disfluencies were grouped into hesitations, repeats, revisions, false starts, and incomplete utterances; all disfluencies were coded with special symbols according internationally accepted principles of discourse annotation (MacWhinney, 2010), as exemplified below.

2.1. Hesitations

Hesitations can be described as *silent (unfilled)* or *filled pauses (fillers)* involving an articulation of some sound(s) during the delay (Watanabe, Rose, 2012). Silent

pauses (1, 2) can be defined as periods of silence longer than the pauses in an equivalent fluent utterance (Fraundorf, Watson, 2013), e.g.:

- (1) *I lisa (.) uvidela i zaxvatila za lapu.*
'And the fox [PAUSE] saw [it] and grabbed [his] foot.'
- (2) *Malen'kij kozleno(.)k zaxotel po(.)kupats'a.*
'The baby-goat-[PAUSE within the word] wanted to swim-[PAUSE within the word].'

Fillers can be defined as verbal interruptions that do not relate to the proposition of the main message (Fraundorf, Watson, 2013), and they can be further classified into (3, 4) nonlexical formations (such as *uh* and *um* in English) and (5, 6) semantically insignificant words and constructions (such as *well*, *like*, *you know* in English), e.g.:

- (3) *Potom sobaka (.) mmm (.) prognala koshku.*
'Then the dog [PAUSE-FILLER-PAUSE] chased the cat away.'
- (4) *I uvidela, chto kot (.) aaa (.) xochet skushat' ptenchikov.*
'And [the dog] saw that the cat [PAUSE-FILLER-PAUSE] wanted to eat the baby-birds.'
- (5) *Sobaka za nej poshla. To est', pobezhala.*
'The dog went to her. I mean, [it] run.'
- (6) *Ptica uletela za cherv'achkami. Za cherv'achkami. Vobshchem, kormit'.*
'The mother-bird flew [to look] for worms. For worms. Like, to feed [the baby-birds].'

2.2. Repeats

Repeats (i.e., unmodified repetitions) can be grouped into repeated (7, 8) parts of a word, (9, 10) words, and (11, 12) strings of words, e.g.:

- (7) *Mal'y— (.) mal'yshi ptency ostalis' odni.*
'Baby:INCOMPLETE-PAUSE-baby-birds were left alone.'
- (8) *A lisa xotela by s'e— (.) s'est'.*
'And the fox would want to eat: INCOMPLETE-PAUSE-to eat.'
- (9) *I (.) i ona uvidela, chto ptency spaseny.*
'And [PAUSE] and she saw that the baby-birds were saved.'

- (10) *Ona (.) ona zalezla na derevo i nachala podbirats'a k (.) k ptenchikam.*
'She [PAUSE] she climbed up the tree and started sneaking to [PAUSE] to the chicks.'
- (11) *I skazali (.) i skazali èto (.) svojej mame.*
'Then [they] told [PAUSE] then [they] told this [PAUSE] to their mother.'
- (12) *A lisa smotrela za kozlenkom za kozlenkom.*
'And the fox was looking at the baby-goat at the baby-goat.'

2.3. Revisions

Revision (or *repairs*) are self-corrections of material already spoken (Fraundorf, Watson, 2013) and they can be classified into (13, 14) phonological, (15, 16) lexical, and (17, 18) grammatical modifications of speech.

- (13) *Prinesla odnogo cherv'aka dra (.) dl'a vsej ptenchikov.*
'[She] brought just one worm for:INCORRECT for all the chicks.'
- (14) *Esli by ne xvatila (.) ne sxatila ee za xvost.*
'If [she] [did] not grab [PAUSE] [did] not grab her tail.'
- (15) *A ptica, kotoraja na suku lezhala nu (.) sidela, èto vse zametila.*
'And the bird who [was] laying [FILLER-PAUSE] [was] sitting on the branch saw all this.'
- (16) *Xotela s'est' pti— nu (.) lisu.*
'[The bird] wanted to eat the bird:INCOMPLETE-FILLER the fox.'
- (17) *Byli (.) bylo mama ptica i tri ptenca.*
'[There] were-PAUSE-was a mother-bird and three chicks.'
- (18) *Ona ej skazala: nikogda (.) uxodi i nikogda ne prixodi².*
'She said to her: never-PAUSE-go away and never come back.'

A process of revision presumes that a speaker repairs previously uttered something erroneous (Fraundorf, Watson, 2013); however, sometimes an incorrect utterance might be replaced by another incorrect utterance (19), also, a correct utterance might be reformulated into (20) another correct utterance and even into (21) an erroneous utterance (Balčiūnienė, 2013), e.g.:

² Syntactic reformulation. More on this see Kilani-Schoch et al. (2008), Kazakovskaya, Balčiūnienė (2012a, 2012b).

- (19) *A potom prishel lis i sxvatil baran-- nu jagnenka*³.
'And then the fox came and grabbed the sheep:INCOMPLETE-FILLER the lamb.'
- (20) *Ona poletela z— eshche za edoj.*
'She fled [to look] for-INCOMPLETE again for food.'
- (21) *A lisichka ubexhala (.) uletela.*
'And the fox run [PAUSE] fled away.'

2.4. False starts

False starts (22, 23) can be equaled to crossings out in writing, i.e. a speaker starts producing an utterance and drops it after just a few words, e.g.:

- (22) *Kogda na beregu... Oj, ne znaju dazhe, kak ètot malysh nazyvaets'a.*
'When ashore... Oh, I do not know even how to call this baby.'
- (23) *I potom mama prishla i pomogla emu vybratsa. A on mmm... I lisa uvidela i zaxvatila za lapku.*
'And then the mother came and helped him to get out. But he [FILLER]... And the fox saw [him] and grabbed [his] foot.'

We recognize false starts as separate type of linguistic disfluencies, which, in contrast to the revisions and repetitions, are neither revised nor repeated after dropping them.

2.5. Incomplete (abandoned) utterances

Incomplete (abandoned) utterances (24, 25) considered any utterances where the obligatory ending is missing, e.g.:

- (24) *Ona zalezla na derevo i... Zalezla na derevo i obliznulas'.*
'She climbed up the tree and... [She] climbed up the tree and licked [her lips].'
- (25) *Oni by skazali, chto koska za nimi... A sobaka ix spasla.*
'They would tell, that the cat... But the dog saved them.'

³ There is a baby-goat but not a lamb on the picture.

3. Research Method

3.1. Participants

The data contains a part of the *Corpus of Russian TD and SLI children language* (Kornev et al., 2015) available online at <http://rclc.iling.spb.ru/corp/>⁴. The subjects of the study were 12 clinically-referred monolingual 6-year old (mean age 76 months) SLI children who received 2 years course of speech therapy and 12 TD peers. SLI children were recruited from those who attended remedial treatment unit for speech and language disordered kindergartens. Exclusion criterion was non-verbal IQ on Raven's matrix below 24. In all cases, morphosyntactic backwardness (below 5 year level) was coupled with articulation/phonological disorders. TD children were recruited from day care center for kindergartens. For both the TD and SLI group, informed consent was obtained from parent before the experiment.

3.2. Task Administration

The subjects were assessed by means of the *Russian Assessment Instrument for Narratives—RAIN* (Kornev, Balčiūnienė, 2014; 2015). After warming up, each subject performed two tasks, i.e. storytelling and story retelling according wordless picture sequences *the Baby-Birds* and *the Baby-Goats* (see Figure 1); each of the tasks was followed by ten comprehension questions (CQ) (see Table 1).

The *Baby-Birds* sequence



The *Baby-Goats* sequence

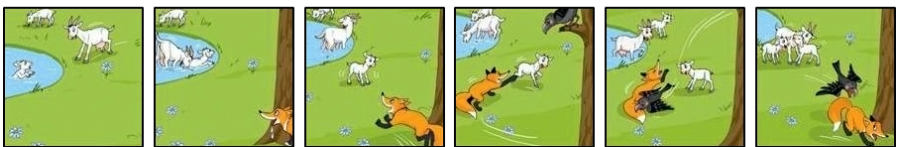


Fig. 1. Stimulus material (based on Gagarina et al., 2012)

⁴ The Corpus was developed in the framework of a national project *Development of linguistic sub-systems in typically-developing and language-impaired children: Corpus-based and experimental study* [Formirovanie jazykovykh podsistem u detej s normoj i otstavaniem v razvitanii rechi: korpusnoe i eksperimental'noe issledovanie tekstov] carried out with the financial support of the Russian Foundation for Humanities, grant No. 14-04-00509.

Table 1. Comprehension questions (based on Gagarina et al., 2012)

<i>The Baby-Birds</i>	<i>The Baby-Goats</i>
0. Did you like the story?	0. Did you like the story?
1. Why do the baby-birds open their mouths?	1. Why does the baby-goat shout?
2. Why did the mother-bird fly away?	2. Why did the mother-goat get to the water?
3. Why did the cat climb the tree?	3. Why did the fox grab leap to the baby-goat?
4. Why did the dog grab the cat's tail?	4. Why did the bird grab the fox's tail?
5. Why did the dog chase the cat?	5. Why did the bird chase the cat?
6. What was the dog thinking when he was chasing the cat?	6. What was the bird thinking when she was chasing the fox?
7. What was the cat thinking when she was being chased by the cat?	7. What was the fox thinking when she was being chased by the bird?
8. If the mother-bird was able to speak, what would she say to the dog?	8. If the mother-goat was able to speak, what would she say to the bird?
9. If the mother-bird was able to speak, what would she say to the cat?	9. If the mother-goat was able to speak, what would she say to the fox?
10. If the baby-birds were able to speak, what would they say to their mother when she came back?	10. If the second baby-goat was able to speak, what would he say to his mother when she came to him?

The sessions of the 1st and the 2nd task were separated by a few minutes of free talk between the interviewer and the child; the order of tasks was counterbalanced (see Table 2) with regard to narrative mode (telling vs. retelling) and story complexity (the *Baby-Goats* considered more complex than the *Baby-Birds*; see Kornev, Balčiūnienė, 2014; 2015).

Table 2. Counterbalancing scheme

Children No.	Session No. 1	Session No. 2
1, 5, 9	Telling <i>Baby-Birds</i>	Retelling <i>Baby-Goats</i>
2, 6, 10	Telling <i>Baby-Goats</i>	Retelling <i>Baby-Birds</i>
3, 7, 11	Retelling <i>Baby-Birds</i>	Telling <i>Baby-Goats</i>
4, 8, 12	Retelling <i>Baby-Goats</i>	Telling <i>Baby-Birds</i>

3.3. Data Coding and Analysis

All the stories and dialogues were video-recorded and transcribed according to the conventions of the *Codes for the Human Analysis of Transcripts* (CHAT; MacWhinney, 2010) by three graduate transcribers. They were blind to the diagnosis of the participants. During discourse annotation, the main structural characteristics, such as turn-takings, overlaps, pauses, repeats, revisions, etc., were encoded for the

analysis. Then, individual measures (a number of each category of disfluencies per utterance) were estimated and submitted for statistical analysis by means of one way ANOVA and paired-samples T-test.

4. Results

Due to our aim at comparing disfluencies in different discourse genres (narrative and structured dialog), the data analysis was performed separately for storytelling and for dialog based on the CQ. The total number of linguistic disfluencies per utterance produced in the story-telling was the same both in the SLI and the TD groups (see Table 3).

Table 3. Distribution of linguistic disfluencies in the storytelling within the SLI vs. TD groups

Measures	SLI N = 12		TD N = 12		df	F	Sig.
	M	σ	M	σ			
1. A total number of disfluencies per utterance	0.88	0.43	0.63	0.42	1	0.8	0.40
2. A number of false starts per utterance	0.008	0.02	0.064	0.086	1	3.19	0.092
3. A number of incomplete utterances per utterance	0.09	0.07	0.027	0.054	1	4.45	0.05
4. A number of hesitations per utterance	0.40	0.26	0.47	0.26	1	0.12	0.74
4.1. A percentage of filled hesitations among all hesitations	0.34	0.33	0.72	0.20	1	9.34	0.007
4.2. A percentage of unfilled hesitations among all hesitations	0.64	0.379	0.28	0.20	1	3.63	0.07
5. A number of repetitions per utterance	0.12	0.06	0.36	0.33	1	1.48	0.27
5.1. A percentage of repeated parts of word among all repeats	0.40	0.46	0.01	0.04	1	8.24	0.01
5.2. A percentage of repeated words among all repeats	0.31	0.44	0.716	0.46	1	3.74	0.07
6. A number of revisions per utterance	0.07	0.06	0.18	0.24	1	0.56	0.48
6.1. A percentage of phonetical revisions among all revisions	0.10	0.20	0.48	0.43	1	5.09	0.04

However, some forms of disfluencies discriminated the groups (see Table 3). Among all hesitations, the filled hesitations (fillers) were more dominant (72%) in the

TD children, whereas the unfilled hesitations were numerous (54%) in the SLI peers. The incomplete utterances were significantly more numerous in the SLI children.

The total number of repetitions was similar within both the groups, but, again, some forms of repetitions discriminated the groups. The repeated parts of word were significantly prevalent among all repeats in the SLI children while repeated words were the most frequent in the TD peers. The total amount of revisions did not differ between the groups but the phonological revisions were significantly more numerous in the TD children than in the SLI peers (see Table 3).

Comparative paired-samples T-tests statistical analysis of disfluencies in storytelling vs. dialogue discourse revealed significant differences in the SLI group (means 0.77 and 0.50 respectively; $t = 2.4$; $P \leq 0.03$) and in the TD group (0.82 and 0.45 respectively; $t = 2.36$; $P \leq 0.05$).

The children produced more filled hesitations in the narratives than in the dialogues (means 0.22 and 0.12 respectively; $t = 1.93$; $P \leq 0.069$); they also produced more revisions (per utterance) in total (means 0.16 and 0.07 respectively; $t = 2.48$; $P \leq 0.023$); finally, the phonological revisions were produced in only narrative discourse (means 0.00 and 0.07 respectively; $t = 3.29$; $P \leq 0.004$).

Dynamic approach to narrative analysis elaborated in our previous studies (Kornev, Balčiūnienė, 2014; 2015) for clinical practice evidenced that narrative production process depended on variables such as task order, story complexity and mode. However, the general linear model of statistical analysis did not reveal any significant dynamic influence of the story cognitive complexity and task order on the production of disfluencies.

5. Discussion and Conclusions

Child language development might be treated from twofold perspective: from the linguistic structural static dimension and from psycholinguistic on-line discourse analysis dimension. The last one focuses on the process of planning, programming, and self-monitoring. Linguistic disfluencies have close relations to all of these processes and thus they should be appropriate basis for studying the processes of discourse production in children.

In our study, we addressed some questions permanently debated in many previous publications related to adult spontaneous (unprepared) discourse (e.g., Levelt, 1983; 1984; Kibrik, Podlesskaya, 2007). It is interesting to cite some assumptions that fillers might play not the same functional role in the child speech as in the adult one (Pepinsky et al., 2001; Taelman et al., 2009).

The main question addressed the nature of linguistic disfluency: is it some kind of failure to concord speech programming and production processes, a manifestation of child language immaturity or a complex of individual strategies related to speech self-monitoring used by the narrator in a discourse production. The total number of disfluencies was rather close in both groups and thus this did not support the “immaturity” hypothesis. But some qualitative differences between the groups were observed. For example, when faced with some problems of the utterance programming, the TD children tended to use filled hesitations, whereas the SLI children used

to explore silent pauses or to repeat part of a word. Besides that, language impaired subjects tended to produce shorter utterances ($MLU_{SLI} = 4.17$; $MLU_{TD} = 5.62$; $F = 6.37$, $P \leq 0.040$) to reduce the cognitive loading in utterance programming.

The findings encourage discussing child speech disfluencies as the on-line strategies to resolve complications in utterance programming in parallel with speech production. It looks obvious that usually the SLI children start uttering before they finished elaborating the plan of the utterance and consequently perform its language programming in parallel with speech execution. Their limited cognitive resources overloading and thus prevent completing the utterance. In the case of child-adult structural dialog cognitive loading is reduced and disfluencies appear less frequently. To sum up, in childhood linguistic disfluencies represent the complex of distinct strategies in discourse production due to a level of the subject's language competence, cognitive resource, and the circumstances of narrative production.

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