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Title: Pausing as and Indicator of Fluency in the Russian of Finnish Learners.

Year: 2008

Version:

Please cite the original version:

Ullakonoja, Riikka. 2008. Pausing as an Indicator of Fluency in the Russian of Finnish Learners. In: Barbosa, Plinio A., Madureira, Sandra, Reis, César (eds.) Proceedings of the Speech Prosody 2008 Conference, Campinas, Brazil, p. 339-342.

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Pausing as an Indicator of Fluency in the Russian of Finnish Learners

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Abstract

Previous research shows that pausing and disfluencies are common in non-native speech. The aim of this study was to investigate the relationship between fluency and pausing in Russian read-aloud speech of 12 Finnish university students and examine their fluency development during a 3.5-month study-period in Russia. To assess fluency, 30 Russian teachers rated the students' speech samples (on a 1–5 scale). The samples were then analysed perceptually and acoustically for pause frequency, duration and placement. Results show that pausing can be an indicator of foreign language fluency and that most students develop considerably in their Russian read-aloud fluency during their stay in Russia. Hence, when teaching students to read aloud in a foreign language, pausing should be emphasized as a way to become a fluent reader.

1. Introduction

Fluency is often mentioned as an aim of foreign language (FL) teaching. It has also been shown in few studies [5], [13] that when FL learners spend some time in the country where the target language is spoken, their speech becomes more fluent. Fluency has been defined in many ways e.g. by the number of pauses, their place and duration; speech rate, rhythm and hesitation [3], [11], [14]. The features of speech that make it fluent are situation and text dependent, and hence, speech with few pauses is not necessarily always perceived as fluent [7], [8]. In this study, fluency is used to refer to the fast, smooth reading aloud. As pause frequency and speech rate have been found to be the most important temporal correlates for read-aloud speech fluency perception [3], pausing is investigated here and speech rate will be discussed in a parallel study [15]. This is a follow-up study that concentrates on learner's speech production, which is not a very common approach in the field of FL prosody.

As shown by a number of previous studies (see e.g. [10], [2], [9]) extensive pausing is typical for non-native speech. Pauses occur together with hesitation, repetition or repair. According to Riegenbach [10] the "chunking together" of disfluencies (several disfluencies in a three word sequence) can be an important indicator of fluency. Pause duration is affected e.g. by the sentence length and pause placement [4].

The purpose of the study was to find out whether speakers are thought to be more fluent in their FL if they have a more native-like pause duration and placement. This article concentrates on the place, duration and frequency of pauses in the learner's speech. The main hypotheses were 1) learners' fluency improves during study abroad experience 2) learners with less pauses and/or shorter pauses are rated to be more fluent in Russian.

2. Material

The 12 subjects were 19–24 year-old female undergraduate major students of Russian. They were native Finnish speakers who reported having no hearing or speaking disabilities. Most of them had studied Russian as their 3rd or 4th FL (in Finland it is common to study 3–4 FLs). Half of the students stayed with a Russian host family during their stay in Russia (all of them participated in the same study abroad program) whereas the rest resided in foreign-student dormitories. A student moved from the host family to the dormitories in the middle of her stay. Each student was recorded three times reading the same dialogue with another student: before, during and after the 3.5-month-stay in Russia. Only the longest (and a difficult) turn of the dialogue (6 sentences) was chosen for the analysis. The total duration of analysed read-aloud speech was c. 12 mins. Students' speaking activity with native Russians and fluency self-evaluation was determined with the help of questionnaires.

3. Methods

The pauses were segmented in Praat [1] according to the auditory analysis. The perceived pauses were labelled as fluent (juncture) or disfluent (non-juncture) pauses [10], [6]. Pauses occurring at the sentence or phrasal boundary were fluent, whereas others were often disfluent sounding. The traditional classification of silent and filled pauses was not respected here because the latter were scarce in the material and because it was not considered useful in measuring fluency. The common minimum pause duration of 200 ms. was not used either. The pause duration was automatically measured in textgrids with a script. The quantitative analysis and graphical representation of the results was conducted in Excel and the statistical analysis in SPSS. Students' speech was compared with each others in different recording sessions and with the fluency rating each sample received in the fluency evaluation task.

Expert judges, 30 Finnish teachers of Russian as a FL, rated the fluency of the students' speech samples by perception. Teachers were from different age groups and had different amounts of experience in teaching Russian as a FL. They heard the stimuli ($n = 36$, each student in each recording session) once in a randomized order and rated the fluency of each sample on a 1–5 scale (1 = very disfluent, 5 = very fluent). Most teachers participated in the experiment by filling out a web-based questionnaire and listening to the sound file on their PC. The rest did the evaluation in a language lab. Teachers were also asked to give a definition of fluency and, after listening, determine the factors hindering fluency.

Thus, each sample received an average fluency measure, which was later compared to the acoustic analysis. The

interjudge reliability was evaluated by determining the reliability coefficient (the value of Cronbach's alpha) which yielded 0.92. Hence, the reliability of the ratings was high and most judges had a similar idea of what is fluent speech. The average rating for all the judges and all the speakers was 3.17 (std = 1.05) which indicates that the judges used more or less the whole scale in their fluency evaluations.

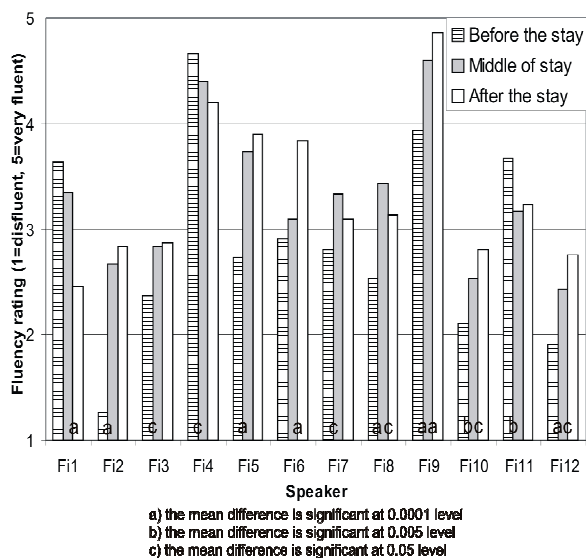
4. Results

4.1. Fluency perception

In the open questions prior to listening, the teachers defined fluent reading in a FL as speech that has a native-like pronunciation of segments, intonation, word stress and short pauses at correct places (over 10 mentions each). In addition, after listening they mentioned that monotonous speech and faltering made the samples sound disfluent.

As Figure 1 shows, the learners' fluency develops during their stay in Russia. 9/12 learners received a lower fluency rating before their stay in Russia than in the middle of it and 7 of them even improved their rating at the recording after their stay. 9/12 learners had a better fluency rating following their stay in Russia than prior to it.

Figure 1: Fluency of the speakers at different stages of learning



Most (16/24) mean differences were statistically significant at least at the 0.05 level (Figure 1). This means that 8/12 learners improved their fluency significantly by the middle of their stay and 3 of them even improved their fluency significantly after that. When comparing only the fluency ratings before the stay and after it, it was found that the majority (8/12) of the learners received a statistically significantly better fluency rating after their stay than before it ($p < 0.005$ for all).

4.2. Students' self-evaluation and exposure to Russian

When asking the subjects following their stay in Russia whether they could speak and read Russian more fluently now than before their stay, all responded affirmatively. Half of

them (6/12) said that their pronunciation had developed noticeably. Some (5/12) said that they still had trouble producing the intonation in the way they wished. The students had different amounts of contact with Russians during their stay. Half of the students stayed with a host family where naturally they had possibilities to practice oral skills. The majority (11/12) of the students also spoke at least a little with their teachers outside the classroom. Four students said that they did not know any Russians they could talk to in the town in which they were staying. Only 4 students said that they tried actively to get in contact with native speakers. The students who lived with a host family did not get significantly better fluency ratings than those residing in the dormitories. In fact, students living in the dormitories were more fluent in each recording session and they improved as much as those living with a host family.

4.3. Pausing

4.3.1. Pause frequency

Firstly, the frequency distribution of the two pause types (fluent and disfluent pauses) was studied. The total number of pauses varied, because sometimes the speakers did not pause e.g. at the phrase boundary (as might traditionally be expected) but indicated the boundary by other prosodic means. Individual differences in pause frequency were found, but on average, the frequency of the fluent pauses remained the same and the frequency of the disfluent pauses decreased as the amount of experience increased (Table 1). 7/12 speakers had less disfluent pauses in the middle of their stay than before it. 8/12 speakers had less disfluent pauses after their stay than in the middle of it. The majority of the learners (9/12) had less disfluent pauses following the stay than prior to it. The distribution of fluent and disfluent pauses in different stages of stay did not differ statistically significantly between the speakers (Pearson's Chi-Square for fluent pauses $\chi^2(22) = 2.358$, $p = 1.00$, for disfluent pauses $\chi^2(22) = 13.901$, $p = 0.905$).

Table 1: Frequency of different pause types (fl. = fluent pauses, disfl. = disfluent pauses).

Speaker	Before the stay		Middle of the stay		After the stay	
	fl.	disfl.	fl.	disfl.	fl.	disfl.
Fi1	11	3	10	2	13	2
Fi2	11	6	9	3	8	1
Fi3	11	3	11	4	12	1
Fi4	9	1	8	2	8	1
Fi5	8	1	7	0	7	0
Fi6	12	0	12	2	12	1
Fi7	8	1	8	1	9	0
Fi8	10	4	10	1	10	2
Fi9	9	1	6	1	7	0
Fi10	10	6	11	4	12	2
Fi11	9	1	11	0	10	2
Fi12	12	6	12	5	10	2
Mean	10.0	2.8	9.6	2.1	9.8	1.2

There was a relationship between the frequency of different pause types and fluency ratings. A statistically significant negative linear correlation was found between the

mean fluency rating and frequency of fluent pauses (Pearson's Correlation = -0.586, $p < 0.001$). The correlation existed also between the mean fluency rating and the frequency of disfluent pauses (Spearman's Correlation = -0.657, $p < 0.001$) and between the mean fluency rating and the total frequency of pauses (Pearson's Correlation = -0.742, $p < 0.001$).

4.3.2. Pause duration

Secondly, pause duration (absolute and relative durations) was measured in the two pause types and compared to fluency ratings. Absolute durations of disfluent pauses were in average shorter than fluent pauses (Table 2). A correlation was found between the mean absolute durations of different pause types (Pearson's correlation = 0.426, $p < 0.05$).

The relative durations were calculated by proportioning the duration of each pause with the total duration of the sample. Thus, the number indicates the percentage of pausing in total utterance duration and allows the interspeaker comparison (Table 2). The majority of the speakers have the smallest relative duration of fluent pauses (9/12 speakers) and disfluent pauses (8/12 speakers) in the middle of the stay.

Table 2: Mean duration of different pause types (fl. = fluent pauses, disfl. = disfluent pauses): absolute duration in ms. and relative duration in % of the utterance duration.

Speaker	Before the stay		Middle of the stay		After the stay	
	fl.	disfl.	fl.	disfl.	fl.	disfl.
Fi1 (ms.)	619	364	442	110	467	432
Fi1 (%)	27	16	24	6	21	19
Fi2 (ms.)	416	888	273	118	374	225
Fi2 (%)	16	33	16	7	23	14
Fi3 (ms.)	457	347	318	156	335	192
Fi3 (%)	23	18	18	9	20	11
Fi4 (ms.)	240	211	209	234	296	95
Fi4 (%)	15	13	14	16	20	6
Fi5 (ms.)	420	323	454		453	
Fi5 (%)	23	18	28		30	
Fi6 (ms.)	400		343	138	283	165
Fi6 (%)	21		19	8	17	10
Fi7 (ms.)	346	577	290	113	335	
Fi7 (%)	20	34	18	7	22	
Fi8 (ms.)	333	123	211	161	313	566
Fi8 (%)	18	7	13	10	16	29
Fi9 (ms.)	261	133	292	73	240	
Fi9 (%)	17	9	21	5	17	
Fi10 (ms.)	443	527	355	351	408	183
Fi10 (%)	17	20	19	18	21	9
Fi11 (ms.)	426	455	291		409	677
Fi11 (%)	20	21	15		17	28
Fi12 (ms.)	405	231	318	352	342	266
Fi12 (%)	19	11	16	17	17	14
Mean(ms.)	402	430	317	218	358	352
Mean (%)	20	18	18	12	20	17

When the mean pause durations were compared to the fluency ratings, it was found that the most fluent speakers (Fi4 and Fi9) had a fairly short mean relative disfluent pause duration. Mean absolute durations of both fluent and disfluent

pauses indicated significant negative correlations with the fluency rating (for fluent pauses Pearson's Correlation = -0.393, $p < 0.05$; for disfluent pauses Pearson's Correlation = -0.478, $p < 0.01$). Mean relative durations of disfluent pauses showed a similar relationship (Pearson's Correlation = -0.372, $p < 0.05$), but the fluent pauses did not (Pearson's Correlation = 0.072).

4.3.3. Pause placement

Fluent pauses occurred at phrasal and sentence boundaries whereas disfluent pauses were situated in the middle of the word (when there was hesitation, repetition or repair), in the middle of the noun phrase, or between the verb and its complement.

Table 3: Frequency of disfluent pauses at most common places of the utterance (for all speakers).

Phrase	Before the stay	Middle of the stay	After the stay	Total
A. ona uyezhaet (pause) ni segodnya ...	4	6	0	10
B. yesli khochesh (pause) eyë provodit...	3	1	3	7
C. chasov (pause) v devyat	3	4	1	8

Disfluent pause placement was very much speaker dependent, however there were three places that were common (more than three occurrences) for disfluent pauses (Table 3). It is interesting that in phrases A and C there was considerably fewer disfluent pauses after the stay than before or middle of it. Perhaps this indicates that students had (either through experience or repetition of the same text) learnt not to pause in the middle of these constructions. Overall, there were repairs or repetitions in the speech of 3-4 subjects before the stay and in the middle of it. After the stay however, 7/12 students used repairs. It was found that before the stay it was the 3 least fluent subjects (Fi2, Fi12 and Fi10), in the middle of the stay the two least fluent (Fi12 and Fi10) and after the stay the three least fluent (Fi1, Fi12 and Fi10) that had "disfluency clusters" (several disfluencies in a three word sequence).

5. Discussion and Conclusions

As previous studies [5], [13] have shown and as it was hypothesized in this study, the learners' fluency improves during their study abroad experience. As the amount of experience increases, the fluency also improves. There was no systematic development in the way, as Freed [5] has found that weaker students would develop in their fluency more significantly than better ones. Certainly students who were already quite fluent prior to their stay in Russia (Fi4 and Fi9) could not improve as much as the weaker students on this scale, which evaluated all students' fluency. The student who improved her fluency the most was a student (Fi2) who received a very low rating before her stay. Some students (Fi4 and Fi11) achieved lower fluency ratings following their stay than prior to it. The explanations for this decline can be that they have become more conscious of their pronunciation, and hence, are trying to self-correct more, which causes more

repairs and disfluent pauses (after the stay more students used repairs in their speech than before the stay). The other explanation for fluency decline can also be the limited duration of the speech samples. The students may have spoken more fluently in general, but by chance had more disfluencies in this particular sample. The finding that students residing with a host family did not improve their fluency more/were not more fluent than the group living in the dormitories, is consistent with another study [12].

The other hypothesis was that FL speakers using less and/or shorter pauses are rated to be more fluent in Russian. The study showed that the speakers' fluency developed during their study abroad experience, hence they used less disfluent pauses after their stay. Speakers' pause frequency distributions were in fact rather similar, which could have been predicted due to the fact that the subjects were reading the same text. Therefore, speech with multiple pauses was perceived as less fluent than speech with few pauses. Particularly the high number of disfluent pauses (that often occurred together with repairs, repetitions and other hesitation phenomena) created a less fluent impression. Interestingly though, there were 5 samples with no disfluent pauses that did not, however, receive a very high fluency rating (2.9–3.9). Therefore, it cannot be said that speech with no disfluent pauses would always be perceived as very fluent. This indicates that the pause frequency is not the only feature contributing to the perception of speech as fluent.

There was individual variation in pausing (see also e.g. [4]). When comparing the duration results to native speakers, whose mean pause duration was in Volskaya's study [16] 173.5 ms. (range 153–188 ms.), we can see that students' pauses are longer, perhaps because of their slower speech rate. If learners' fluent pauses are short, disfluent pauses tend to be short also and vice versa. It should be noted that even very short disfluent pauses were easily detected in the auditory analysis because they caused interruption of the speech flow (e.g. in the middle of the sentence) whereas very short fluent pauses may go unnoticed. The majority of the speakers had the smallest relative pause duration in the middle of the stay. This may be due to e.g. a faster speech rate, which they have become used to using in Russia. Furthermore, it was found that the more fluent the speaker, the shorter her disfluent pause duration is (both in absolute and relative values).

For pause placement, it can be concluded that it is indeed the "disfluency clusters" (as also Riggenbach [10] has shown) that give an impression of disfluency. This was proven because in each recording session at least the two least fluent subjects had the most "disfluency clusters".

The study can be criticised for only having the author (a non-native speaker) to conduct the perceptual pause detection. The perceptual analysis however, was verified acoustically. The perceptual pause detection and acoustic analysis were completed prior to the fluency ratings and therefore could not affect the perceptual pause classification.

The implications of this study to FL learning are that firstly, we should encourage our students to spend some time in the country where the target language is spoken. Secondly, in teaching more attention ought to be paid to pause placement in order to improve fluency. When students are reading a text aloud they are often focusing on pronunciation and could simultaneously be developing their pausing skills.

In conclusion, this study has shown that fluency improves during the study abroad experience and that pausing is an

indicator of fluency. Further research should consider other prosodic factors, e.g. speech rate and intonation, which potentially influence the fluency evaluations.

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