Temporal characteristics of sound sequences in disfluencies: repetitions and restarts
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Introduction
Speech planning and articulation operate quasi-simultaneously, which result disfluencies in spontaneous speech. Adults’ disfluencies tend to occur when speakers encounter difficulties in forming concepts, activating syntactic frames, or retrieving the syntactic and semantic information of lexical items (Levelt 1989). Two types of disfluency phenomena are repetitions and restarts. Repetitions refer to repeated portions of speech (e.g., words or phrases) that do not signal emphatic meaning (for example: ebédeítünk majd majd hazamentünk ‘we had lunch then then we went home’). Restart arises when the flow of speech is interrupted within a word, then the speaker pronounces the whole word (for instance: hazame- hazamentünk ‘we went ho- home’) (Bortfeld et al. 2001). The common characteristic in these disfluencies is that identical sound sequences are perceived; however, phonetic correlates of the reparandum and the repair (i.e. the first and the second instance of the word/word fragment) may be different (Shriberg 1999; Benkenstein & Simpson 2003). The difference mostly manifested in the temporal characteristics of sound sequences, which is affected by the duration of speech sounds in particular (Fig. 1.). The present study investigates the durational patterns of speech sounds in repetitions and restarts. What kind of differences can be identified between the acoustic-phonetic correlates of the reparandum and the repair? To answer this question, we analyze the segmental duration of repetition and restarts in Hungarian spontaneous speech. We hypothesized that i) repairs would be pronounced faster than reparanda, ii) the duration of vowels is the most sensitive to change.

Methodology
Seven males and seven females participated in this research (mean age: 40 years). The corpus consisted of spontaneous speech samples (everyday life topics) from the BÉA database (Gósy 2012; Neuberger et al. 2014). The total duration of the recordings was 7.5 hours. The data set contained more than 700 disfluency phenomena from the two types: repetition and restart, which means approximately 6,000 speech sounds (manually segmented vowels and consonants). We measured and compared the duration of the two instances of sound sequences in two levels: word-level and sound-level in each disfluencies. Annotation and measurements were conducted using Praat (Boersma–Weenink 2009) software; statistical analysis was carried out using SPSS.

Results
We found that the repair is significantly shorter than the reparandum both in repetitions and restarts. In general the speech process is interrupted after the second or third speech sound but there is difference between function words and content words. The change of sound duration affected mainly the vowels, but not the consonants.

Discussion
We can conclude that the reparandum followed by an editing phase grants enough time for the speaker to pronounce the repair faster than the reparandum, because the speaker repeats the target word only if the difficulty has already been solved. The results confirmed that disfluency may affect a variety of phonetic aspects of speech, including segment durations. Results may provide detailed information to our understanding of the cognitive processes which underlie the timing organization of speech. They can also contribute to the
improvement of models for disfluency processing in speech applications (speech synthesis and recognition).

Figures

![Figure 1](image.jpg)

**Figure 1.** Reparandum (1\textsuperscript{st} instance) and repair (2\textsuperscript{nd} instance) in case of repetition (Hungarian *hogy hogy* ‘that that’)

References


