Accent familiarity influences template matching mechanisms: ERP evidence from Polish

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ABSTRACT

The processing of foreign-accented speech has been scarcely investigated so far in neurolinguistic studies, whose outcomes suggest that semantic processing is, in general, hampered in non-native speech (Hanulíkova et al., 2012; Romero-Rivas et al., 2016; Grey and van Hell, 2017). The current study tested whether the previous findings can be equally applied to familiar and unfamiliar foreign accents.

I conducted two ERP experiments with auditorily presented sentences to investigate neural reactions towards templates (i.e., high cloze probability words embedded in sentential context) and template violations. The experimental material was pre-tested to determine whether the L2 Polish accent used was easily identifiable (i.e., Ukrainian) or caused identification problems (i.e., Korean). In Experiment A, 120 Polish sentences were recorded by an L1 Polish speaker and an L1 Ukrainian speaker. In Experiment B, the same material was read by L1 Polish and L1 Korean speakers. The brain activity of native Polish speakers (28 in Experiment 1; 24 in Experiment 2) was recorded during the EEG sessions.

In both experiments, template violations resulted in a sustained globally-distributed negativity followed by a P600 effect for Polish accent. As for the Korean accent, the negativity was less significant when compared with Polish accent. For both foreign accents, no late positivity was observed. Such results confirm that linguistic anticipatory and re-analysis processes are hampered in non-native speech. Also, the anticipation mechanisms seem to be inhibited to a greater extent in the case of infrequent – when compared with frequent – accents.

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INTRODUCTION

Research on the processing of foreign-accented speech: some researchers decided to investigate accents which were common (and hence easy to recognize) in a given environment (e.g. Hanulíková et al., 2012); in some cases, they investigated accents which were uncommon and unrecognizable (e.g. Grey and van Hell, 2017); and in some cases, the authors used various foreign accents in the same experiment (e.g. Romero-Rivas et al., 2015, 2016).

Experiment A: stimuli recorded by a non-native speaker of Polish whose accent was fairly strong, commonly used, and **easy** to recognize (i.e., Ukrainian).

Experiment B: stimuli recorded by a non-native speaker of Polish whose accent was fairly strong, but **very difficult** to recognize (i.e., Korean).

The aim of Experiments A and B is to indicate whether accent familiarity is a factor determining semantic and/or anticipatory proceessing.

METHODS AND MATERIALS

Both experiments were carried out with the aid of EEG/ERP technique (see Figure 1). The participants were presented with sentences uttered in native accent (in both experiments) and with sentences uttered in Ukrainian (Experiment A) or Korean (Experiment B) accents. Half of the sentences uttered in each accent were correct; half of the stumuli contained semantic anomalies or incorrect template endings (see Table 1 and Table 2).

Table 1. The number of experimental stimuli

SEMANTIC PROCESSING	ANTICIPATORY PROCESSING
60 sentences containing **semantic anomalies** (30 in native accent + 30 in foreign accent)	60 sentences containing **incorrect template endings** (30 in native accent + 30 in foreign accent)
60 sentences with **no semantic anomalies** (30 in native accent + 30 in foreign accent)	60 sentences containing **correct template endings** (30 in native accent + 30 in foreign accent)

Table 2. Sample stimuli

SEMANTIC ANOMALIES	TEMPLATE ENDINGS
Two years ago, Eve moved to the countryside so she started breeding ***chickens / *a saw*** *and bought a tractor.*	*During the meeting, Tom was out of sorts so his friend only added fuel (lit. 'olive') to the* ***fire / *dough*** *and made Tom annoyed with his comment.*

Figure 1. EEG/ERP method

RESULTS

Incorrect template endings

Experiment A

- Similar neural reactions (i.e. globally distributed negativities) to incorrect template endings were observed in native-accented and Ukrainian-accented Polish. However, late positivity (associated with meaning re-analysis) was present only in native speech (see Figure 2).

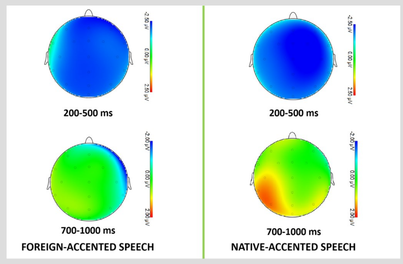

Figure 2. Reactions to incorrect template endings in Experiment A.

Experiment B

- Slightly hampered neural reaction (i.e. weaker globally distributed negativity) to incorrect template endings were observed in Korean-accented Polish when compared with native Polish. Late positivity (associated with meaning re-analysis) was again present only in native speech (see Figure 3).

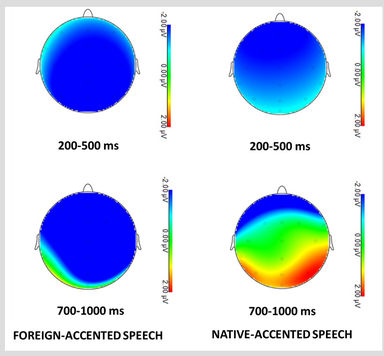

Figure 3. Reactions to incorrect template endings in Experiment B.

Semantic anomalies

Experiment A

- Similar neural reactions (i.e. late N400 effect) to incorrect template endings in native-accented and Ukrainian-accented Polish (see Figure 5).

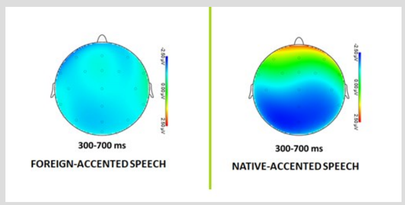

Figure 4. Reactions to semantic anomalies in Experiment A.

Experiment B

- The N400 effect was present both in the case of native Polish and Ukrainian-accented Polish, but it was more globally distributed in the latter case (see Figure 4).

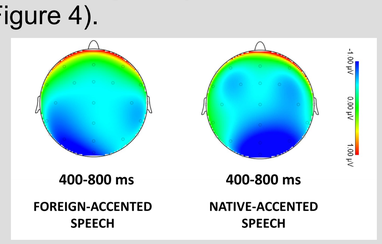

Figure 5. Reactions to semantic anomalies in Experiment B.

DISCUSSION

Anticipation mechanisms

- The results seem to indicate that the mechanisms associated with anticipatory processing **are hampered in non-native when compared with native speech**, but only in the case of **unfamiliar foreign** accents.
- Late positivity (associated with meaning reanalysis) was **present in native-accented speech only** (both in the case of familiar and unfamiliar foreign accents).

Semantic processing

- Juxtaposing the results of Experiment A and Experiment B also tentatively confirms that **semantic processing is not affected by accent familiarity**, at least in the case of monolingual comprehenders processing their native language.

Behvioural results

- In both experiments, behavioural measures were high both in the case of native and foreign-accented condition: mean sentence comprehension accuracy equalled 87.46% in Experiment 1 and 84.67% in Experiment 2, with the differences between speakers being not statistically significant.

CONCLUSIONS

The obtained results would confirm that meaning reanalysis processes are hampered in non-native speech, which is indicated by the lack of late positivity in foreign when compared with native speech. Also, the anticipation mechanisms seem to be hampered for foreign-accented speech but only in the case of unfamiliar – as opposed to familiar – foreign accents. Such results remain in accordance with the findings of previous studies on non-native speech processing (Hanulíkova et al., 2012; Romero-Rivas et al., 2015; Gibson et al., 2017).

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