The Perception of Non-Native Lexical Tone in an African Language:
Russians Go Kpelle

Studies on non-native phonemic perception have started long ago – cf. the notion of "phonological sieve" already in [Trubetzkoy 1939] meaning that one's native phonology projects its oppositions and sound rules on the non-native sounds. The perception of tone is a much younger research domain. Some findings in this area concerning both native and non-native tone perception can be formulated as follows: i) level tones tend to be confused with each other, as well as contour tones with a similar direction, e.g. mid rising and falling rising tones in Mandarin; ii) level and contour tones with similar phonetic features are often confused with each other, e.g. high level and high falling tones in Mandarin [Abramson 1975; Gandour 1978; Yip 2002; So & Best 2010].

Most studies of tone perception have been based on South East Asian languages which are famous for their rich phonological systems with phonemic contour tones. Much less attention has been paid to African languages with tonal systems consisting mainly of level tones.

The present paper reports an experiment on the perception of tone in Kpelle (Mande > South-Western Mande) by native speakers of Russian, a non-tonal East Slavic language. Kpelle is spoken by approximately 1 million people in Liberia and the Republic of Guinea.

The study is based on Guinean Kpelle which has two phonemic level tones – High and Low. Tones form fixed consequences or patterns realized on morphemes, lexical morphemes being almost always equal to words. Three tonal patterns on bisyllabic words were used in this experiment: two level patterns, /H/ as in *lɔ́ɣɔ́* 'week' and /L/ as in *lɔ̀ɣɔ̀* 'forest', and one phonetic contour pattern /LHL/ as in *tùŋɔ́ŋ* 'heel'. The /LHL/ pattern consists of phonemic level tones though together they are realized as phonetically complex contour tone.

The goal of the experiment was to find out whether similar level patterns /H/ vs. /L/ are confused with each other more often than a level pattern (/H/ in the experiment) and a non-similar contour pattern /LHL/ if all targets are pronounced in isolation by the same speaker.

23 native speakers of Russian took part in the experiment. They were divided into two groups. Group 1 discriminated between /H/ and /L/ patterns. The training session consisted of 4 words with 2 examples per each pattern. Then the participants listened to 16 words, 8 with /H/ pattern, and 8 with /L/ in chance order. Each word was repeated 3 times in the recording. The listeners were asked to mark for each word whether it had /L/ or /H/ pattern. Group 2 had to discriminate between /H/ and /LHL/ pattern called "Gliding" for the listeners. There were also 4 words for familiarization session and 16 words in the experiment itself.

The results were quite unexpected – the participants in Group 1 identified /H/ and /L/ patterns at 88,94% correct on average but there were only 61,25% correct answers on average in Group 2, this difference being statistically significant ($p < .001$). To account for a success in Group 1 I hypothesized that though the targets were recorded in isolation, the listeners could have used the previous targets including those presented in training session as reference levels.

To test this hypothesis I modified the experiment and invited 23 new participants. The innovation was that in both groups (referred as Group 1′ and Group 2′ below) each target was preceded by 8 seconds of relaxing music which was supposed to "suppress" the previous context. The average score was 81,77% and 62,5% for Group 1′ and Group 2′ respectively (see Figure 1). Thus music made the score in Group 1′ considerably lower than the score in Group 1 (statistical significance was not reached due to a small sample size; however, the effect size can be classified as medium, Cohen's $d = .54$) and didn't affect Group 2′ as compared to Group 2. This means that the listeners identifying level tones relied on the context to a large extent though they did quite well even with the context suppressed – the score in Group 1′ (81,77%) strongly exceeds the result of 50% expected if the participants had guessed the tones merely by chance.

To explain all the results including relatively low scores in Groups 2 and 2′ one could suggest a new dimension of tonal perception: the "interpattern" contrast between /H/ and /L/ patterns is successfully captured though the "intrapattern" contrast between H and L tones within the /LHL/ pattern is more difficult to identify.

Figure 1
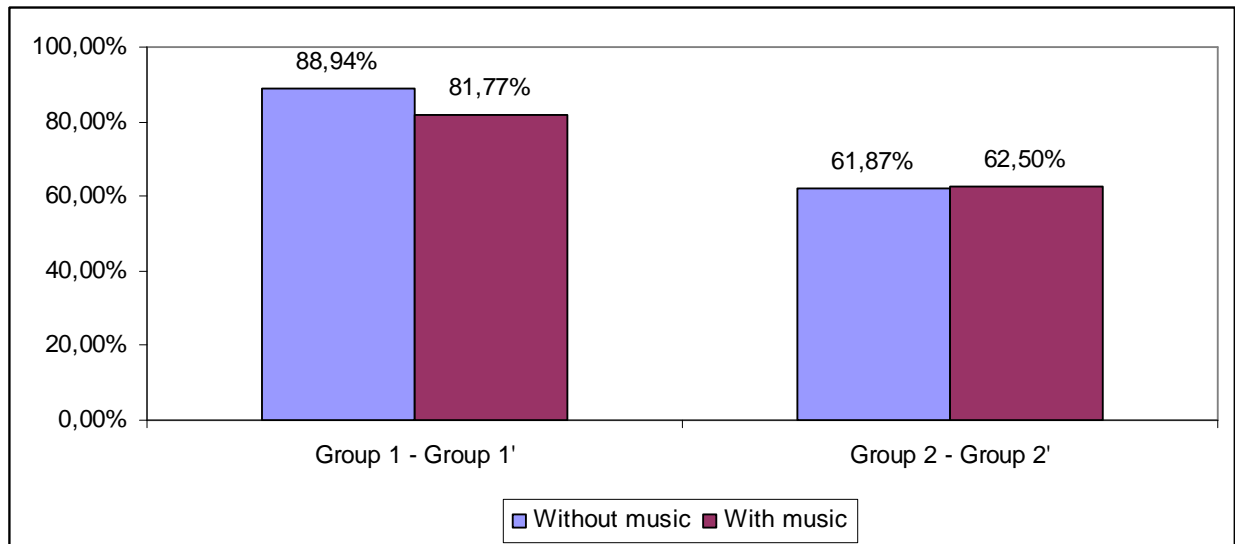
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