

# The Influence of the Mother Tongue on Rhythm Perception

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The purpose of this study is to explore the influence of the mother tongue on rhythm perception. In particular, the aim of the study is to examine the extent to which English and Japanese speakers are sensitive to differences between regular rhythm and irregular rhythm.

Rhythm irregularity can be divided into two types, clashes and lapses. An uninterrupted succession of accents, and the absence of accents create clashes and lapses respectively. In Japanese, unaccented (weak) syllables are frequent and irregularly distributed so that the rhythm becomes irregular. For instance, the rhythm of a phrase can be “W (weak) W W W W W W S (strong)” in reading a phrase “efferutou no ue” (top of Eiffel tower). However English rhythm tend to be regular, with alternations between stressed and unstressed syllables being mostly even. This is reflected in music as well. In Japanese traditional music, such as Gagaku, the rhythm can be 5/4 (2+3/4); in English (and all Western music of all types), regular rhythms such as 3/4 and 4/4/ prevail. Due to the familiarity with irregularities in both language and music, it is hypothesized that Japanese listeners would be more sensitive to differences between stimuli with regular and irregular rhythms than English listeners would. Hannon & Trehub (2005) and Patel (2007) support this hypothesis, showing the influence of environmental sounds on rhythm perception.

My study investigates this hypothesis, using language, music and pure tones as stimuli, all with similar rhythmic structures. The aim of using three types of stimuli was to explore the connection between language, music and basic auditory processing. In experiments run through OpenSesame, Japanese and English native speakers listen to two sound files and rate the rhythmic difference between the first and second file on a scale from 1 to 6. Although in some trials, there is no difference between the two, the second sound file (test stimulus) in each trial is a variant of the first sound file (familiarization stimulus). The variant is made by removing syllable from the familiarization file. Similarly syllable addition to the familiarization stimuli makes the second different. Familiarization stimuli are compared with all of the test stimuli within a group. For example, familiarization stimulus in “Regular Rhythm” group written below is compared with all test stimuli of regular rhythm group.

Figure 1: Example of stimuli

Regular Rhythm			Irregular Rhythm		
Familiarization Stimulus: S(strong)W(weak)SWSWSW			Familiarization Stimulus: SWSWWSWSWW		
Three sorts of test stimuli (structure preserving, lapse, and clash)			Three sorts of test stimuli (structure preserving, lapse, and clash)		
Structure Preserving	Lapse	Clash	Structure Preserving	Lapse	Clash
SL(long)SWSWSW	SWSW <b>W</b> SWSW	<b>SS</b> WWSWSW	SL(long)SWSWSW	SWSW <b>W</b> WSWSW	<b>SS</b> WWSWSWW

Ratings for “Lapse” and “Clash” minus “Structure Preserving” is treated as accuracy. Pilot results show that Japanese listeners are more accurate than English listeners in detecting differences between irregular rhythms in all types of stimuli. This result indicates that the native language and its rhythmic characteristics affect rhythmic perception, regardless of the type of stimulus, and that there is no perceptual difference between lapses and clashes.

## References

- Hannon, Erin E., and Sandra E. Trehub. "Tuning in to musical rhythms: Infants learn more readily than adults." *Proceedings of the National Academy of Sciences of the United States of America* 102.35 (2005): 12639-12643.
- Patel, Aniruddh D. *Music, language, and the brain*. Oxford university press, 2007.