

Inducing the Phenomenon of Monophonic Polymeter
through Side Effects of Lyrics Translation

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Abstract

In cognitive science, the idea that language shapes thought—a once highly controversial claim—has recently come to wider acceptance. While many studies have been conducted to demonstrate, for instance, how languages affect our concept of time and perception of objects, an equally important question of how languages can shape what we hear has not yet been fully explored. Thus, this study aimed at examining the effects of lyrics translation on the singer's perception of music. Specifically, a simple melody of "Happy Birthday" was used to compare native Korean and native English speakers' metric perception of the song. Subjects were instructed to clap on perceived downbeats while singing the song, and results were videotaped for further analysis. Possibly as a result of discrepancies in the syllabic emphases in the Korean translated version, Koreans in general perceived the first beat of the song as a downbeat while native speakers of English tended to clap in ways that reinforced the melodic emphases present in the original score. While this experiment has some inherent shortcomings with confounding variables, the result suggests that the phenomenon of monophonic polymeter can potentially be induced as a side effect of lyrics translation, biasing the way singers perceive music.

INTRODUCTION

Overview*Language & Thought*

The idea that language shapes thought—a once highly controversial claim—has recently come to wider acceptance, as more studies have been conducted to show how language shapes one's perception of the world. It has been demonstrated that languages that we speak has effects on our perception of events (Boroditsky, Ham & Ramscar, 2002), color (Davies & Corbett, 1997), grammatical-gender-associated objects (Konishi, 1993), space and navigation (Majid, *et al*, 2004), and time (Boroditsky, 2001), among others.

As for the question of how language affects what we hear, however, most of the evidence has been limited to the phoneme level, such as in the difficulty of perceiving difference in /r/ and /l/ sounds among Japanese speakers (Bradlow & Pisoni, 1997). A detailed exploration of how languages affect holistic perception of music, especially in terms of meter and rhythm, is yet to be performed.

Preference of Duple over Triple Meters

Also of relevance to this study, of how speakers of different languages perceive the overall musical structure, is humans' general tendency to prefer duple over triple meters. Numerous experimental evidences have suggested an innate human preference for duple groupings. Bolton (1894) first reported a prevailing tendency in almost all of his fifty subjects to group by four, given an isochronous sequence of equidistant tones—even though they could be perceived as consisting of groups of 2, 3, 4, or none. In addition, a recent study by Bergeson & Trehub (2005) explored 9-month-old infants' perception of auditory temporal sequences, and found that infants detected change in pattern with and context of duple, but not triple, meter. In this manner, studies have consistently shown humans' preference for the duple meter. Thus, examining metric perception of music among speakers of different languages naturally lends itself to the question of whether the extent to which people prefer duple meter is dependent on language (and culture).

Monophonic Polymeter & Metric Perception

Finally, observing disparity in the metric perception of a given music among speakers of different languages would suggest that monophonic polymeter could potentially be induced as a side effect of lyrics translation. An example of monophonic polymeter is JS Bach's Sarabande, Cello Suite #3, for which listeners could

perceive the meter in multiple ways¹--depending on whether the emphasis is placed on the first beat or the second beat of the phrase.

Hannon, Snyder, Eerola, & Krumhansl (2004) have explored the role of melodic and temporal cues in perceiving musical meter, and their findings suggested that listeners combine multiple melodic and temporal features to perceive musical meter. Unfortunately, however, the interplay of syllabic stress (derived from words in lyrics) and melodic accents (derived from the musical line) has been somewhat overlooked by studies on metric perception. This study thus works with an instance in which metric perception is affected solely by the knowledge of another language.

Question & Hypothesis

This study aimed to answer the question, “How does people’s perception of meter and rhythmic emphasis change when singing the same song in different languages?” A simple melody of “Happy Birthday” was chosen to observe effects of lyrics (that has been translated into Korean) on the singers’ metric perception. Because of differences in places of syllabic stress in the Korean version, the first beat of each phrase was predicted to be perceived as the downbeat (even though, melodically, it serves as anacrusis):

<Red star denotes syllabic emphasis (from the lyrics) >

[ORIGINAL SCORE]

[PREDICTION: PERCEIVED STRUCTURE WITH KOREAN LYRICS]

Under the predicted model, the syllables that receive emphases in the Korean translation version would very nicely align with the downbeats. In other words, the main prediction to singing “Happy Birthday” in Korean—as opposed to English—was in the *shifting* of the downbeat within the original time signature of 3/4, and not so much in the *change* in the time signature (i.e. into a duple meter).

¹ Professor Jonathan Berger, Music 151 Lecture on “Rhythm Perception.” May 10, 2006.

METHOD

Seven Korean bilinguals (about equally fluent in both Korean and English) and five native speakers of English (whose main language was English and could not speak Korean) were asked to sing “Happy Birthday,” clapping in places when they “felt the downbeat or a big beat.” Their singing and clapping were videotaped for further analysis. Places of clapping were noted, along with the overall rhythm and length of rests taken (if any) between phrases².

RESULTS

Brief Summary of Findings

Excluding three subjects who “correctly” perceived the song as having a 3/4 time signature that starts with a pick-up, the general trend was that Koreans almost always perceived the very first beat of the song as a downbeat, regardless of the language they sang in. What was not anticipated, however, was the enormous preference of duple over triple meter among Koreans (but not among native English speakers) in a way that ironically made their clapping pattern inconsistent across the four phrases of the song. In contrast to Koreans who more-or-less clapped every other beat (seemingly ignoring much of the melodic or syllabic cues present in the song), native English speakers tended to rely on the lyrics and the melodic line (which were highly compatible, as the song was originally intended to be sung in English) to determine when to clap. As a result, their clapping did not display any recurring patterns *within* a phrase.

Observations for Korean (bilingual) Speakers³

Overall, two unanticipated observations were made. First, all Koreans clapped (for the most part) every other beat, suggesting that they perceived the meter as either 2/4 or 4/4. This predominant preference for duple over triple meter among Koreans was so strong as to dwarf the possible effects that syllabic differences found in the Korean language may have on neglecting the anacrusis. In fact, this preference for duple over triple meter persisted even when the Korean subjects sang in English—although this phenomenon is likely to have resulted from undesirable priming/ anchoring effects, as the subjects sang in one language immediately after another. Second

² I considered the “Happy Birthday” song as comprising of four phrases, the portion “Happy birthday to you,” being a single phrase.

³ Excluding two subjects who clapped “correctly”

unexpected finding was that Koreans added in an additional beat (or even two beats) at the end of each phrase in such a way that made their duple clapping highly inconsistent *across* phrases. Had they not included these additional beats, their clapping actually would have made the beat patterns for each of the phrases to look identical, achieving relative stability. The following two models show two possibilities of singing the original rhythm in 2/4:

[ORIGINAL SCORE in $\frac{2}{4}$ WITHOUT ADDED BEATS]

<Red star denotes syllabic emphasis (Korean); Underlined segments denote phrase boundaries>

Despite that these two alternatives allow for consistency across phrases, they nonetheless feel unnatural because the stressed syllables do not get assigned to the downbeat on most measures—and perhaps this is the reason that no Korean subjects actually clapped to either of these patterns. But by inserting additional beat(s) at the end of phrases—seemingly arbitrarily and in different places for different subjects—some phrases actually ended up *recovering* the anacrusis (though it had been neglected in the very first phrase). The following shows the clapping patterns performed by four Korean subjects:

<Blue star denotes a clap>

One subject followed the upper pattern, and three subjects followed the lower pattern. The dotted boxes denote extra beat(s) added at the end of phrases.

These unanticipated findings are quite puzzling. First, What made all Koreans to clap every other beat? Can we conclude from these clapping patterns that Koreans *perceived* “Happy Birthday” as a duple meter? Or could it be that clapping every other beat was more of an automatic process, semi-independent from the choice of the song, that should be viewed more as a cultural phenomenon, and thus not actually providing much insights into the metric perception of “Happy Birthday”?

Second, why were extra beat(s) added to the ends of phrases? Did they imagine a fermata at the end of each phrase, or did the struggle to decide (during the extra beat) whether to come in on a downbeat or an upbeat? What is even more interesting is the number of beat(s) added was different for different individuals, resulting in different phrases acquiring the anacrusis. This suggests that the metric perception of “Happy Birthday” is highly unstable, and it would be insightful to measure the extra time taken between phrases with and without clapping to determine whether the act of clapping is confounding with the subjects’ metric and rhythmic perception (as well as production) of the song.

Power of Duple Preference to Manipulate Rhythm

Before moving on to discuss the results of native English speakers, it is worthwhile to make note of one Korean subject who managed to (quite ingeniously) transform the rhythm in order to clap consistently in the 4/4 time signature with a pick-up.

The image shows a handwritten musical score for the song "Happy Birthday" in 4/4 time. The notation is written on a single staff with a treble clef. The time signature is 4/4 with a question mark. The melody consists of eighth and quarter notes. Below the staff, blue stars are placed under specific notes to indicate clapping. A legend above the staff states "<Blue star denotes a clap>". The subject has added a pick-up note at the beginning of the first phrase, which is marked with a blue star. The clapping pattern is consistent throughout the piece, following a 2-beat cycle (clap on the first beat, no clap on the second beat).

The subject struggled at first to fit her clapping to the song, and ended up changing the song’s rhythm in order to clap consistently across all the phrases, with a pick-up. Interestingly, the subject was not aware that she had manipulated the rhythm, until was told by the experimenter at the end of the experiment session. This phenomenon suggests that the preference for duple meter can be so strong as to have the subject unknowingly alter the rhythm of the song to accommodate the duple meter. Yet it also reveals an inherent shortcoming of the experimental instruction to “clap” as means of measuring subjects’ metric perception, for the act of clapping can biases the way subjects perceive and sing the song.

Observations for Native Speakers of English (who do not know Korean)⁴

Clapping patterns for native speakers of English were much more varied:

<Blue star denotes a clap>

The diagram illustrates the clapping patterns for four phrases of the song "Happy Birthday" in 3/4 time. The notation shows the melody and lyrics for each phrase. Below the notation, four clapping patterns are shown, labeled 1 through 4. Blue stars indicate claps, and dots indicate no claps. Pattern 1 shows claps on syllables. Pattern 2 shows claps on every beat. Pattern 3 shows claps on the second and third beats of each phrase. Pattern 4 shows claps on every beat except the first of the third phrase.

Except for one subject who clapped on every beat (#2), native speakers of English clapped based on syllabic emphasis, which naturally reinforced the melodic emphasis (as the lyric for “Happy Birthday” was originally written in English). But because the clapping was placed in the locations of syllabic emphases, no regular patterns *within* a phrase could be found (in contrast to Koreans who had a very strict, regular pattern of clapping every other beat). Yet, because all four phrases (except for a slight, insignificant variation in the third phrase that replaces the words “to you” with “dear ___”) had identical lyrics, the clapping patterns remained identical *across* phrases, suggesting stability in the subject’s metric perception. (The case for subject #4, who was an exception to this, is discussed in the subsection below.)

A subject who began with a downbeat but transitioned into having a pickup

One subject whose clapping pattern changed actually began on a downbeat but transitioned into having the anacrusis. (See clap pattern #4 in the data shown above.) As shown in the diagram, while the first and second phrases began as a downbeat, the subject was hesitant to clap on the first syllable of the third phrase, and eventually identified the anacrusis upon arriving at the fourth phrase. This interesting observation suggests that the English lyrics can serve as positive cue in correctly perceiving the overall metric structure of the song.

A Note on Participants who Clapped Correctly

Three participants (two Korean and one native English speakers) who clapped correctly commented that they felt quite sure that the way they clapped was “correct,” although none of them claimed to have explicitly seen the score to “Happy Birthday” before. All three of the subjects were music majors and/or had extensive training in music.

⁴ Excluding one subject who clapped “correctly”

DISCUSSION

Conclusion

As expected, majority of Koreans clapped on the very first beat of “Happy Birthday,” suggesting they failed to perceive the anacrusis as a result of differences in syllabic emphases placed on by the Korean lyrics. Similarly, native speakers of English tended to rely on the syllabic stress of English lyrics to determine their clapping patterns—which looked vastly different from that of Korean subjects. This result suggests that languages can manipulate people’s metric perception of songs with lyrics that have been translated. Moreover, it hints at the possibility of experiencing the strange phenomenon of monophonic polymeter by multilingual speakers. This study, however, suffered from many unanticipated inconsistent findings that must be resolved in the near future. The following section discusses these shortcomings in greater depth.

Problems Encountered

Some of the major problems encountered in this experiment lie in the choice of subjects and the method used to detect subjects’ metric perception of “Happy Birthday”. The following describes a revised experimental design to be implemented in the future:

Subjects

Rather than comparing Korean-English bilinguals with native speakers of English who cannot speak Korean, the revised experiment should narrow down the subjects to bilinguals (of Korean and English), such that the level of familiarity of English versus Korean would serve as the independent variable. This will allow one to pick out the effects of first language, the level of expertise in each language, and/or culture of singing on metric perception.

Procedure & Apparatus

Instead of clapping on perceived big beats, subjects should tap their finger to the rhythm of “Happy Birthday” (while singing the song in their head) to an apparatus that can detect the velocity, pressure, and duration of the hit. Clapping was problematic because (1) it made the subjects become conscious of how they were perceiving the beats, (2) it did not allow for detecting subtle differences the level of emphasis that the subjects perceived for each beat, and (3) it was a discrete (all-or-nothing) motion that required too great of a motor

movement with a blatant feedback of a loud sound. By using the apparatus (resembling one key of a piano), these problems can be minimized.

Allowing Extra Time to Switch to another Language within a Subject

Finally, there must be some gap of time (ideally a few days) when testing the same subject using different languages. The current experiment was problematic in that the bilingual participants were asked to sing in two languages, one after the other. As a result, during the second round, the participants were primed and anchored to the clapping motions they had made just prior (to the first language), so that it appeared as though the language that they sang in had no apparent effects on metric perception.

Related Questions for Future Research

The following are further questions to be explored related to this topic that would solve some of the mysteries linked to the current experimental findings:

- To what extent is the perception of anacrusis dependent on the familiarity of the original English version of “Happy Birthday”?
- Is the preference to clap in a duple meter by Koreans a habitual (cultural) phenomenon independent from the Happy Birthday song?
- Is there a range of bilingual ability for which the rhythmic emphasis varies depending on the language used, within an individual (on-line effect)? What is the amount of exposure to the Korean needed to arrive at a consistent off-line effect of language?
- For other popular songs translated in various languages, to what extent can the lyrics (syllabic stress) shape and transform the singers’ perception of the song’s overall metric structure?

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