Examining the Rhythmic Characteristics of Japanese Songs Translated from English in the Meiji Era with the normalized Pairwise Variability Index*

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1. Introduction

Previous studies have shown that the normalized Pairwise Variability Index (nPVI), a rhythm metric, of English speech is higher than the nPVI of Japanese speech (Ramus, Nespor, and Mehler, 1999; Patel and Daniele, 2003; Patel, Iversen, and Rosenberg, 2006). The nPVI was introduced as an objective measure to present the differences between stress-timed and syllable-timed languages based on impressionistic judgement.

Existent studies have utilized the index tool to demonstrate that the differences in the nPVI of English speech, a stress-timed language, and the nPVI of French speech, a syllable-timed language, are also reflected in the nPVI differences of their instrumental music. The instrumental music that was examined was composed around the year 1900 by English and French composers who spent their entire lives in the countries of their birth and who were active in the "nationalism" period of music history (Patel and Daniele, 2003). Patel (2008) suggested the possibility of musical nPVI research that compared the rhythmic structure of speech and music. Hattori (2018) pursued this line of research to examine songs translated by Sazanami, a Japanese artist who translated American pop music in the 1960s, and some early Beatles songs. The copyright years of original English songs were 1949–1964, the years after World War II.

This study tested the hypothesis that the differences between the nPVI of English speech and that of Japanese speech hold when English songs are translated into Japanese,

because the arrangement of notes should be retained as closely as possible so that the tune sounds the same. The remainder of this paper is organized as follows: Section 2 follows the Introduction and describes the hypothesis and method of the musical nPVI research; Section 3 presents the results; Section 4 discusses the results; Section 5 concludes the paper.

2. Hypothesis and Method

Previous studies have employed the linguistic concept that vowels form the core of syllables, assumed that musical notes are nearly equal to syllables, and compared vowel-based rhythmic measures of speech to note-based rhythmic measures of music (Patel, Iversen, and Rosenberg, 2006). In the literature, musical note values have been assigned duration as follows: a 16th note was assigned a duration of 1, an 8th note was assigned a duration of 2, a quarter note was assigned a duration of 4, and so on. This conversion method has been adopted in previous studies on the interface between speech and music (Patel and Daniele, 2003; Patel, 2008).

The nPVI is a device used to detect differences in the arrangement of musical notes. It employs the following equation (Ramus, Nespor, and Mehler, 1999; Grabe and Low, 2002; Patel and Daniele, 2003):

(1)

$$nPVI = \frac{100}{m-1} \times \sum_{k=1}^{m-1} \left| \frac{d_k - d_{k+1}}{\frac{d_k + d_{k+1}}{2}} \right|$$

where m is the number of durations in the sequence and d_k is the duration of the kth element. For this study, vocalic nPVI values were calculated for ten English songs

imported to Japan during the Meiji Era (1868–1912) as well as for the translated-to-Japanese versions of the songs. The sequential order of stressed and unstressed syllables in English lyrics exerts considerable influence on the output nPVI values of musical notes. Studies have attested that the nPVI of English speech is higher than the nPVI of Japanese speech (Ramus, Nespor, and Mehler, 1999; Patel and Daniele, 2003; Patel, Iversen, and Rosenberg, 2006). The hypothesis adopted here is the same as the hypothesis in Hattori (2018): that the same nPVI relationship holds when English songs are translated into Japanese, because the arrangement of notes should be retained as closely as possible so that the tune sounds the same. Schematically:

(2) nPVI (speech): English > Japanese [attested]

nPVI (vocal music):

Original English songs ≥ Songs translated into Japanese

This study focused on ten English songs introduced in Japan during the Meiji Era (1868–1912). Table 1 presents these song titles. At that time, the Meiji government demonstrated a strong interest in establishing music as a school subject in the new school system; the translated songs were to be taught at primary schools (Tezuka, 1967; Matsumura, 2019; Sato, 2019). The historical background is as follows (*Grove Music Online*, "Shōka").

(3) European music was introduced to Japan by Portuguese and Spanish missionaries in the mid-16th century, but the ban on Christianity (1588) and the isolationist policy (after 1639) stopped the development of imported music…. When the restrictions were lifted at the Meiji Restoration (1868), European music was again imported, with fresh vigour and unusual rapidity, in the form first of military band music and then of Protestant hymns. The Meiji government actively encouraged the broad diffusion of Western music, and the new school system (1872)

adopted a European style of singing in its curriculum.

Table 1: Titles of the ten songs examined

	English title	Music by	Date	Japanese title[1]
1	Annie Laurie	Lady John Douglas Scott	Traditional	*Saijo*
2	The Blue-bells of Scotland	Traditional	Traditional	*Utsukushiki*
3	Dreaming of Home and Mother	J. P. Ordway	1868	*Ryoshuu*
4	Long, Long Ago!	Thomas Haynes Bayly	c1833	*Tabi no Kure*
5	Massa's in de Cold, Cold Ground	Stephen C. Foster	1852	*Harukaze*
6	Mollie Darling	William S. Hays	1871 or before	*Fuyu no Seiza*
7	My Dear Old Sunny Home	William S. Hays	(1837-1907)	*Kokyou no Haika*
8	Old Black Joe	Stephen C. Foster	1860	*Oorudo Burakku Joo*
9	Old Folks at Home	Stephen C. Foster	1851	*Ahare no Shoujo*
10	What a Friend We Have in Jesus	Charles Crozat Converse	c1866	*Hoshi no Yo*

The nPVI values of the original English songs and those of the translated versions were calculated. The study's hypothesis was tested against the data.

3. Results

Analysis results for the ten songs are shown in Table 2. The nPVI values of the English songs were higher than the nPVI values of the Japanese translations for five titles (1, 2, 3, 5, and 9). The nPVI values for English songs were the same as those of the Japanese versions of the songs for four titles (4, 7, 8, and 10). One song (6) had a higher nPVI value for the Japanese translation than for the original English song.

Table 2: The nPVI values of ten English songs and their Japanese translations

	English title	nPVI	
		English	Japanese
1	Annie Laurie	82.8	76.6
2	The Blue-bells of Scotland	39.6	36.5
3	Dreaming of Home and Mother	61.2	57.9
4	Long, Long Ago!	35.9	35.9
5	Massa's in de Cold, Cold Ground	45.3	39.3
6	Mollie Darling	38.3	40.3
7	My Dear Old Sunny Home	44.2	44.2
8	Old Black Joe	39.1	39.1
9	Old Folks at Home	49.1	31.2
10	What a Friend We Have in Jesus	42.0	42.0

4. Discussion

Close examination reveals that the apparent exception evidenced in song 6 can be ascribed to one difference in the use of musical notes in English and Japanese. Presented below are the differing parts of the musical scores:

(4) a. English
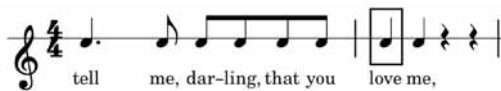
b. Japanese

The use of a half note instead of a quarter note in the Japanese translation boosts the nPVI value of the Japanese version. If the same note were used in this part of the musical score for both languages, rather than the half note used in the Japanese score and the quarter note used in the English score, the same nPVI values would be calculated

for the two languages.

There is evidence to show that the use of the quarter note cited in (4a) is an exception. According to the musical score of the original English song (*Mollie Darling*), the same rhythmic pattern (i.e., the arrangement of notes) shown in (4b) is repeated three times before it reaches the bars shown in (4a). This arrangement could have been repeated once more, but it was not. The reason for this change seems to be linguistic rather than musical. Hayes and Kaun (1996), discussing the text-setting of sung and chanted verses, pointed out that the natural phonetic duration of the syllable influences the number of beats allotted to a syllable. The note assigned to match the text (lyric) tends to be shorter when the vowel of the text is inherently short. The vowel of the text in question (/ʌ/ of *love* in the lyric) is inherently short in English; this fact may have forced the composer to choose a musical note of shorter length. In fact, the vowels of the preceding three parts in English are /ɑː/ (*darling*) and /iː/ (*me* lengthened, as indicated by a "tie" that joins two notes of the same pitch to produce one extended sound) (Taylor, 1989).

To summarize the study results, the data supported the hypothesis for all but one song title. The apparent counterexample is no longer a counterexample if a segmental factor is considered.

5. Conclusion

The nPVI of ten English songs introduced into Japan in the Meiji Era and the nPVI of the songs translated to Japanese were calculated to test the hypothesis that the relationship observed between the nPVI values of English and Japanese speech would hold when English songs were translated into Japanese. The assumption behind the hypothesis was that the nPVI objectively presents the rhythmic differences between stress-timed languages and syllable-timed languages. This hypothesis was supported for all but one title. A closer examination of the score of that aberrant song showed that the apparent exception accounting for the nPVI difference is no longer an exception if a

segmental factor is taken into consideration.

Note

1. The utmost effort has been made to collect scores as close to the original as possible. The
    scores with a time signature of 4/4, the "most common time signature" (Richer, 2002: 2),
    were chosen for future analysis in terms of the "Syllabic Distribution Algorithm" (SDA)
    (e.g., Lerdahl and Jackendoff, 1983; Halle and Lerdahl, 1993; Hayes, 2009).

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