RHYTHMIC STRUCTURE OF ENGLISH AND JAPANESE: A CONSTRAINT BASED ANALYSIS OF NURSERY RHYMES AND HAIKU

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ABSTRACT

Studies on English verses have claimed that the position in which a pause is inserted has a great effect on determining their rhythm. The position in which a pause appears follows a certain rule for the verses to be 'rhythmic', however, it is not yet obvious whether Japanese *Haiku* also has such tendencies or preferences.

In this paper, we analysed and compared the metrical structure of English verses with that of *Haiku* within the Optimality Theory framework. We claim that the constraints employed to account for English verses can also account for the preference of the patterning of *Haiku*.

Keywords: euphonic rhythm, *Haiku*, nursery rhymes, Optimality Theory, pause position.

1. INTRODUCTION

In this paper, we attempt to account for the euphonious rhythm of English and Japanese within the Optimality Theory (hereafter OT) framework.

It is said that the rhythmic structure is different among languages. The rhythm of English, a stress-timed language, is yielded by the isochronic appearance of the stressed syllables. In the case of English popular verses, a line consisting of four beats is considered to have a 'good' euphonic rhythm ([1], [2]). In (1), an example of an English nursery rhyme song is given (B=beat position):

(1) Humpty Dumpty sat on a wall,
B B B B
Humpty Dumpty had a great fall; …
B B B B

While English is able to produce its euphonic rhythm by the repetition of the isochronic stress, what exactly yields such rhythm in Japanese? It is clearly not generated by the same mechanism as English, since Japanese is a non-stress language. This will be the central theme to be taken up in this paper, with particular attention being paid to the role that the pause plays in *Haiku*.

2. PREVIOUS STUDIES

In the case of English, popular verses such as nursery rhymes are said to have a common structure of four lines (a quatrain) of four beats each, sometimes including a "pause" at the end of a line. In Japanese, previous research claims that the unit of "two" is crucial in hypocoristic formation, "four" in baseball chanting, and "eight" in *Haiku* ([3], [4], [5]). It is said that although Japanese *Haiku* is comprised of 17 moras (5 moras in the first line, 7 in the second, 5 in the third), the basic template for each line is 8 moras, pauses inclusive.

According to previous studies of English verses, the position in which a pause is inserted has a great effect on the rhythm of a verse. For example, it is possible to put a pause in the final beat of the second and fourth line, but not in the end of the first and third line. This means that the position of a pause follows a certain rule for the quatrain verses to be rhythmic. On the other hand, it is not yet obvious from previous research whether Japanese *Haiku* also has such tendencies or preferences. In order to find out whether the positioning of the pauses within a *Haiku* has any effect on determining its euphoric rhythm, we will analyse the mechanism of the Japanese rhythm from a phonological perspective.

3. GRID REPRESENTATION AND CONSTRAINTS

The strength or weakness of a syllable is represented by grid height. The grid structure of an English verse is given in (2) ([6]):

(2)
```
        x                   x
    x   x       x       x       x
    x   x   x   x   x   x   x   x
    x x x x x x x x x x x x x x x x
    |   |   | | |   |   |       |
As bright as the sum-mer sun     ϕ
```

Grids allow us to predict which positions within a structure should be filled and which ones can accommodate a pause. The stronger the position (indicated by the higher "x" columns), the more

likely those positions will be filled with a syllable. To put it another way, if a verse contains a pause in one of these stronger positions, it would most likely be considered to be ill-formed. In this way, grid representations can allow us to decide the well-formedness of a verse by its relationship to pauses.

Based on this, [6] directed their attention to English folk songs, and proposed a constraint-based analysis of the quatrain patterns. The relations or rankings of 11 constraints were claimed to derive all the quatrain types observed in folk songs.

In order to test the validity of the constraints that were proposed, we analysed 70 nursery rhymes [7]. The analysis of these nursery rhymes revealed that 8 out of 11 constraints used in folk songs were also applicable to explain all the types that occurred. The list of constraints is shown in (3) (based on [6]):

(3)
FILL STRONG POSITIONS: Fill the four strongest positions in the line.
AVOID LAPSE: Avoid sequences in which no syllable is placed in the interval between any two of the four strongest positions in the line.
LINES ARE SALIENT: Assess violations for any nonsalient line, according to its degree of nonsaliency.
PARALLELISM: The cadences ending the units of the maximal analysis of a quatrain must be identical.
COUPLETS ARE SALIENT: Assess violations for any nonsalient couplet, according to its degree of nonsaliency.
PREFER LONG-LAST: Avoid any quatrain that is not a long-last construction.
QUATRAINS ARE SALIENT: Assess violations to the extent that the quatrain level is nonsalient.
TOTAL LONG-LAST COHESIVENESS: Avoid long-last constructions whose third line is not 4.

Among the 8 constraints, 3 are concerned with the saliency of metrical constituents. A particular constituent is considered to be salient either when its terminus is cadential, or, when the constituent is not disrupted by an internal cadence of equal or greater cadentiality ([6]).

Next, we attempt to clarify whether these constraints can also account for the patterns observed in Japanese *Haiku* [8]. In the analysis, we will pay special attention to the second line of each poem, which has the option of placing the pause in the head, the middle or the end position. Among the 146 *Haiku* poems we observed, let us take a look in detail at 129 poems, in which the second lines consist of the basic seven moras. They can be analysed by referring to the position of morphological boundaries. As shown in Table 1, there is a clear preference in break patterns. The type where the morphological boundary appears in-between the third and fourth mora (3+4 type) and the one appearing in-between the fourth and fifth mora (4+3 type) occupied a great majority, hence we focus mainly on these two patterns (the '.' indicates a mora boundary) .

Table 1: Break patterns based on morphological boundaries (in second lines)

Pattern	Number of poems	Examples
1+6	0	-
2+5	14	*te.o+i.re.te.i.ru 'put hands in the pockets'*
3+4	49	*a.shi.o+hi.ra.ku.to 'when we stretch out our legs'*
4+3	48	*su.ko.shi.no+a.i.da 'for a while'*
5+2	12	*mo.u.i.chi.do+mi.ru 'look once again'*
6+1	6	*to.u.ka.n.ka.ku+no 'in even length'*
7	0	-
Total	129	

If we compare the (3+4) and (4+3) type, the former may insert a pause at the initial position of the line, whereas for the latter, a pause comes at the end. [5] claims that this is related to the line's internal structure; i.e. the parallel structure of the first four moras and the final four, as depicted in (4) (the (P) represents the position where a pause is inserted):

(4)
a. (3+4) type
ashio・hirakuto → ○○○○|○○○○
(P) *a shi o | hi ra ku to*
**a shi o hi | ra ku to* (P)
b. (4+3) type
sukoshino・aida → ○○○○|○○○○
*(P) *su ko shi |no a i da*
su ko shi no |a i da (P)

However, if parallel structure is the factor deciding the position where a pause is located, then it can also be claimed that the position in the "middle" of a line can also qualify as a pause position as in (5):

(5)
a. (3+4) type
ashio・hirakuto → ○○○○|○○○○
a shi o (P)|*hi ra ku to*
b. (4+3) type
sukoshino・aida → ○○○○|○○○○
su ko shi no|(P) *a i da*

In order to verify whether our prediction is true, we conducted a pilot survey on four people. The participants were instructed to listen to three patterns of *Haiku* read by a female native speaker of Japanese. Each pattern had a pause in different positions within the second line (at the head, the end or the middle). We asked them to choose which way of reading was the most natural for them. The result is summarised in Table 2:

Table 2. The Result of the Pilot Survey

Pattern no.	Haiku sample	Total
Pattern 1	(p) ashiohirakuto	2
Pattern 2	ashiohirakuto (p)	1
Pattern 3	ashio(p)hirakuto	1

It is worthy to note here that in addition to [5]'s and our prediction, one participant selected Pattern 2. To account for this result, we employ the OT framework, paying particular attention to the grid structure.

Following [9], we consider that one line in *Haiku* is structured as in (6):

(6)
```
x       x
x   x   x   x
x x x x x x x x
[  ] [  ] [  ] [  ] feet
[       ] [       ] hemistichs
[                 ] line
```

The grid structure for the three patterns is given in (7):

(7)

[Pattern 1]

```
x   x     x       x       x   x
x x x x   x   x   x   x   x x x x
x x x x x x x x x x x x x x x x x
(tobibakode)  (p).a.shi o.hi ra.ku.to.  (sorani i ru)
```

[Pattern 2]

```
x   x     x       x       x   x
x x x x   x   x   x   x   x x x x
x x x x x x x x x x x x x x x x x
(tobibakode)  a.shi o.hi ra.ku.to.(p)  (sorani i ru)
```

[Pattern 3]

```
x   x     x       x       x   x
x x x x   x   x   x   x   x x x x
x x x x x x x x x x x x x x x x x
(tobibakode)  a.shi o.(p).hi ra.ku.to.  (sorani i ru)
```

Based on this, we will consider the relation with OT constraints which were mainly used in folk songs and nursery rhymes. The five constraints that we employ in our analysis below are summarised in (8). Since *Haiku* poems have a different structure from English verses, there is the need to arrange some of the constraints in order to adapt them to our analysis of *Haiku*; specifically, AVOID LAPSE, PARALLELISM, COUPLETS ARE SALIENT, and PREFER LONG-LAST.

(8)

FILL STRONG POSITIONS: Fill the four strongest positions in the line.

AVOID LAPSE: Avoid sequences in which no mora is placed in the interval between any two of the four strongest positions in the line.

PARALLELISM: When we consider the second line as consisting of two hemistichs, each made up of four moras respectively, the hemistichs must be parallel in terms of morphological boundaries.

COUPLETS ARE SALIENT: Consider the second line of *Haiku*, which is made up of two hemistichs, as forming a "couplet", and assess violations for any nonsalient couplet.

PREFER LONG-LAST: Avoid any structure that is not a long-last construction.

Table 3 depicts the three patterns in (7) in relation to the constraints in (8). The symbols "○"and "×" indicate non-violation/ violation.

Table 3. The Relationship of Constraints in *Haiku*

	[Pattern 1]	[Pattern 2]	[Pattern 3]
FILL STRONG POSITIONS	×	○	○
AVOID LAPSE	○	○	×
PARALLELISM	○	×	○
COUPLETS ARE SALIENT	×	○	×
PREFER LONG LAST	○	×	○

The result in Table 3 implies that all three patterns have the same degree of naturalness since the number of "○" is the same. Let us see whether this prediction holds true.

4. THE EXPERIMENT

32 students attending a college in Tokyo participated in the experiment. They were instructed to listen to three patterns of *Haiku*, the (3+4), (4+3) and (5+2) type which had a pause either at the head ([Pattern 1]), the end ([Pattern 2]) or the middle ([Pattern 3]) position of a verse line. Table 4 shows the result of the (3+4) type.

Table 4. Result of the (3+4) type
(e.g. *tobibakode ashiohirakuto soraniiru)*

a.	[Pattern 3] 2 (6%)	[Pattern 2] 28(88%)	no prefer. 2 (6%)
b.	[Pattern 1] 15(47%)	[Pattern 3] 14(44%)	no prefer. 3 (9%)
c.	[Pattern 2] 24 (75%)	[Pattern 1] 4 (12.5%)	no prefer. 4 (12.5%)

Going against the prediction derived from Table 3, there was a clear tendency in participants' judgment about naturalness. That is, Pattern 1 was clearly preferred to either Pattern 2 or Pattern 3. Particularly, the difference between Pattern 1 and Pattern 2 was statistically significant (p=0.00267 (< 0.05)). Considering the results above, we can indicate the power relations of constraints as in (9).

(9)

	AVOID LAPSE	PARA.	FILL	LONG LAST	COUP. SALIENT
☞(P)○○○ | ○○○○			*		*
○○○○ | ○○○(P)		*!		*	
○○○(P) | ○○○○	*!			*	*

The tableau in (9) indicates that Pattern 1 (a pause at the head) will be determined as optimal for the (3+4) type.

Let us next consider the (4+3) type, which was the other major type observed in our *Haiku* data. We gained the following result shown in Table 5:

Table 5. Result of the (4+3) type
(e.g. *dotedeneru sukoshinoaida kumoninaru*)

a.	[Pattern 1] 25 (78%)	[Pattern 2] 7(22%)	no prefer. 0 (0%)
b.	[Pattern 2] 17(53%)	[Pattern 3]12(37.5%)	no prefer. 3 (9.5%)
c.	[Pattern 1] 23 (72%)	[Pattern 3] 5 (15.5%)	no prefer. 4 (12.5%)

The result shows the strong preference for Pattern 2. The difference between Pattern 2 and Pattern 3 was statistically significant (p=8.67993E-07 (< 0.05), as well as the one between Pattern 2 and Pattern 1 (p=0.00179 (< 0.05)). The result can be accounted for by the tableau in (10):

(10)

	AVOID LAPSE	PARA.	FILL	LONG LAST	COUP. SALIENT
(P)○○○ | ○○○○		*!	*		*
☞○○○○ | ○○○(P)				*	
○○○(P) | ○○○○	*!			*	*

If we compare the tableau in (9) with that of (10), we find that both employ the same constraints in the same order. In both cases, Pattern 3 violates the highest ranking AVOID LAPSE, hence is eliminated as a candidate. In the case of the (3+4) type, Pattern 1 does not violate the second highest constraint PARALLELISM because by inserting the pause in initial position, the morphological boundary coincides with the first hemistich. However, Pattern 2 violates this constraint because the first hemistich (4 moras) does not match the morphological boundary (occurring between the third and fourth mora). In this way, Pattern 1 is selected as optimal for the (3+4) type. Let us take a look at the (4+3) type along the same line. Here, unlike the (3+4) type, Pattern 1 violates PARALLELISM because by inserting the pause in initial position, the mismatch between the first hemistich (4 moras) and the morphological boundary (between the fifth and sixth mora) occurs. In this way, Pattern 2 (a pause at the end) is selected as the optimal candidate among the three patterns.

Finally, let us look at the (5+2) type. As we can see from the result indicated in Table 6, Pattern 2 was preferred the most, followed by Pattern 1 and Pattern 3. The difference between Pattern 2 and Pattern 1 was statistically significant (p=0.004 (< 0.05)), as well as the one between Pattern 2 and Pattern 3 (p= 0.02 (< 0.05)).

Table 6. Result of the (5+2) type
(e.g. *nerumaeni mouichidomiru yukidaruma*)

a	[Pattern 3] 2 (6%)	[Pattern 2] 28 (88%)	no prefer. 2 (6%)
b	[Pattern 1] 15(47%)	[Pattern 3] 14 (44%)	no prefer. 3 (9%)
c	[Pattern 2] 24 (75%)	[Pattern 3] 4 (12.5%)	no prefer. 4 (12.5%)

The tableau for the (5+2) type is given in (11):

(11)

	AVOID LAPSE	PARA.	FILL	LONG LAST	COUP. SALIENT
(P)○○○ | ○○○○		*	*!		*
☞○○○○ | ○○○(P)		*		*	
○○○(P) | ○○○○	*!	*		*	*

In observing (11), we find that the ranking of the constraints here is the same as in (9) and (10). Here again, Pattern 3 is eliminated as a candidate because it violates AVOID LAPSE. All three patterns violate the second highest constraint PARALLELISM because the morphological boundary located between the fifth and sixth mora

exceeds the boundary between the first and second hemistich to begin with. If we turn our attention to the third highest constraint FILL STRONG POSITONS, Pattern 1 violates this constraint because a pause comes in initial strong position. In contrast, in Pattern 2 (a pause at the end), all strong positions are filled with moras, hence, this pattern is selected as the optimal candidate for the (5+2) type.

5. CONCLUSION

As the result of our *Haiku* analysis indicates, the same constraints which were used to explain the rhythm of English popular verses can also be applied to clarify another language's rhythm, that is, the preference of a pause position in the second line in Japanese *Haiku*, which produces a euphonious feeling generally expressed as "*goro ga ii"*. It is also remarkable that, considering the perspective of OT, we can explain the preference of a pause position among the types of (3+4), (4+3) and (5+2) using the same constraints in the same ranking. This is important from a linguistic perspective since this suggests that people's intuitively comfortable feeling "*goro ga ii*" can be formalized uniformly by employing the viewpoint of OT for both Japanese *Haiku* and English popular verses.

6. REFERENCES

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