Investigating the Chronological Variation of Popular Song Lyrics Through Lexical Indices

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Abstract

Popular songs can be regarded as a fine representation of modern society and culture. In particular, the lyrics of popular songs are the most important aspect for understanding the sense of values and linguistic sensitivity in a given generation and community. The purpose of the present study is to investigate the chronological variation of popular Japanese songs using stylometric techniques. This study draws on the lyrics of 858 songs, which appeared on the Oricon annual top 20 single hit chart between 1976 and 2015. The linguistic features investigated in this study include five different types of lexical indices, namely (a) number of words, (b) parts-of-speech, (c) word types, (d) character types, and (e) vocabulary level. Multiple regression analysis was conducted to explore the chronological change in the frequencies of lexical indices. The results showed that the frequencies of word types and character types dramatically changed before and after 1990. Moreover, the usages of auxiliary verbs as well as lower level vocabulary became more prominent, whereas the frequencies of adjectival nouns and conjunctions decreased. The findings suggest that a turning point in cultural trends corresponds with the historically significant political and economic events, such as the end of the Showa era and the burst of the bubble economy.

1. Introduction

Popular songs provide a special kind of window into modern society and culture. In the United States, a number of people listen to top-ranked songs on the Billboard chart, and many songwriters make an effort to compose songs that can reach not just domestic listeners but also overseas fans. This tendency can be observed in many other countries, including Japan, where people are enthusiastic about songs that are highly ranked on the Oricon Chart. Multiple factors attract listeners to their favorite music: rhythm, melody,

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harmony, and lyrics. Among these, lyrics are the most important for understanding the sense of values and linguistic sensitivity of a given generation and community. They are essential in *conveying* the message from writers and singers to listeners, as well as *emphasizing* the message for the listeners. Given that people project their own feelings into the lyrics of a song by singing or humming it, lyrics are closely related to the atmosphere of the society and time in which they gain popularity. Although the themes and styles of lyrics vary according to individual artists and songs, they clearly reflect people's sense of values and tend to reflect the time in which they were created. Analyzing the lyrics of popular songs, therefore, is a significant step in comprehending the historical background and psychological condition of people living in a particular place and time.

2. Literature Review

2.1 English Lyrics

Lyrics as a social representation have received considerable attention in the field of sociology. In particular, the themes of love and gender have been at the core of studies on English lyrics. By investigating 235 different lyrics, Horton (1957) showed that the most popular topic of popular songs is romance between men and women. He also reported that the content of love songs differs depending on the genre of music. For example, courtship is the principal theme in hit songs whereas loneliness is the chief motif in country music. Similarly, Carey (1969) revealed changes in perspective with regard to the relationship between boys and girls by comparing the lyrics of songs published in 1955 and 1966. In rock-and-roll poetry released in the 1960s, love was no longer a romantic involvement but a physical desire. Mooney (1968) tracked the thematic change in popular music from the 1920s to 1960s, concluding that the emergence of a sexually casual generation led to a decrease in sentimental love songs.

Researchers have also focused on the linguistic aspects of lyrics using computer-assisted content analysis. For instance, Wilkinson (1976) examined the difference in frequencies of verbs and adjectives between the genders of subjects, and pointed out that descriptions of men and women in the lyrics reflect conventional sex-role expectations. Bértoli-Dutra (2014) also shed light on the difference in the use of multiword expressions among sixteen different music styles or genres by comparing 6,290 American and British popular songs released from 1940 to 2009. A blogger for a ticket-selling company, SeatSmart, investigated the difficulty of sentences in lyrics from 225 songs that topped American charts from 2005 to 2014, showing that the words and sentences used in American hit songs become markedly simpler and easier to read over the period of a

decade (Powell-Morse 2015). Further, the results showed that the lyrics of songs by a Canadian heavy metal band are easier to understand than writing for first-year students in the US.

2.2 Japanese Lyrics

Various studies of Japanese popular music are aimed at identifying the sociocultural ideas and concepts of specific times. For example, Mita (1968) investigated the chronological changes in Japanese peoples' thought before and after the World Wars by analyzing 451 songs from 1868 to 1963, in order to identify emotional factors such as anger, joy, loneliness, and longing. Following the methodology used in this study, Sako (2015) described the chronological changes that have been occurring in Japanese hit song lyrics through the years 1968-2013, and clarified the difference in lyrics between the twentieth and twenty-first centuries. Further, Kubo (1995) set up an archive of 302 popular songs from 1965 to 1989 and showed that youth-themed songs (in Japanese, *wakamono-mono*, songs about young people) decreased in popularity after 1975, whereas love songs gained popularity.

The linguistic analysis of Japanese lyrics started with Mizutani (1982), who applied multivariate statistical analyses to identify similar usages of words in Japanese popular songs in the beginning of the Showa era (1926-1989). After that landmark study, Ito (1997-2000) linguistically analyzed the lyrics of a famous Japanese singer-songwriter, Yumi Matsutoya. Furthermore, Suzuki and Hosoya (2014) examined the lyrics of songs by multiple female singers using machine learning techniques. Although there are many other studies focusing on specific artists or genres in the Heisei era (1989–), few studies have attempted comprehensive descriptions of a wider variety of popular lyrics in multiple generations to observe the macroscopic shifts and changes in cultural trends. In order to fill the gap, this study aims to identify the chronological changes in language use in lyrics during four decades by diachronically analyzing Japanese popular songs released from 1976 to 2015.

3. Research design

3.1 Data

The present study draws on data consisting of the lyrics of songs ranked in the top twenty

on the annual Oricon single chart from 1976 to 2015.² Songs from the same double A-side single are counted separately. If a song was ranked on the chart for several years, the first year that it was ranked is considered the target. Sixteen songs for which the lyrics could not be obtained from the websites *Uta Net*,³ *Uta Map*,⁴ and *J-Lyrics.net*⁵ before May 2016 were excluded. As a result, the number of songs analyzed was 858. Table 1 summarizes the data used in this study.

Table 1. Summary of the Data

Total number of letters	611,244
Total number of words	314,267
Total number of sentences	7,505

Notes. All numbers shown in this table were calculated using MeCab 0.996⁶ and UniDic 2.2.0.⁷

3.2 Linguistic Features

Previous linguistic studies on popular songs have focused primarily on words used in lyrics. While Kobayashi, Kano, and Suzuki (2013) analyzed all the types of words used in texts, other researchers targeted only specific words for analysis. Kinjo (2013) and Suzuki and Hosoya (2014) focused on high frequency words, whereas others analyzed nouns and verbs (Kayane 2002), verbs (*ibid.*), pronouns (*ibid.*; Fujikake et al. 1994; Fujikawa 1999), sentence-final expressions (Suzuki and Yamaguchi 2000), collocations (T. Tsukamoto 2014), the combinations of *kanji* and *kana* readings (Suzuki and Yamaguchi 2000), and expressions in English (Fujikake et al. 1994). Regardless of targeted linguistic features, all of these studies merely analyzed the surface forms of vocabulary, not their lemmatizations.

This study, in contrast, investigates the vocabulary in lyrics by using twenty-six different lexical indices consisting of (a) parts of speech, (b) word types, (c) character types, and (d) vocabulary levels (see table 2). The effectiveness of these indices for computational stylistics has been demonstrated by a wide array of previous studies (e.g.,

² Some of these data were compiled by Amagasa (2014) in order to identify differences in lyrics according to genre.

³ Accessed July 3, 2017, <http://www.uta-net.com/>.

⁴ Accessed July 3, 2017, <http://www.utamap.com/>.

⁵ Accessed July 3, 2017, <http://j-lyric.net/>.

⁶ <http://taku910.github.io/mecab/>.

⁷ <http://osdn.jp/projects/unidic/>.

Kabashima and Jugaku 1965; Yasumoto 1958, 1965). However, no studies have ever applied this set of linguistic features to the systematic analysis of Japanese lyrics. Considering that the results of linguistic analysis of lyrics are susceptible to their contents because of the small number of words they contain compared with other text genres, the present study used the above lexical indices to obtain enough frequency information from relatively short texts. As Tabata (2002) pointed out, the use of lexical indices like parts of speech can alleviate the effect from the contents and clarify the stylistic differences. In this study, the frequencies of the indices are calculated by *jReadability*,⁸ which quantifies the difficulty of Japanese sentences.

Table 2. Lexical indices used in this study

Part of Speech	Interjection (Int.)
	Adjectival noun (Ad.N.)
	Adjective (Adj.)
	Particle (Par.)
	Auxiliary verb (Aux.)
	Conjunction (Con.)
	Pronoun (Pro.)
	Verb (Ver.)
	Adverb (Adv.)
	Proper noun (Pr.N.)
	Common noun (Co.N.)
	Adnominal (And.)
	Other (Oth.)
Word types	Japanese-origin (Jap.)
	Chinese-origin (Chi.)
	Foreign-origin (For.)
	Hybrid (Hyb.)
Character types	<i>Hiragana</i> (Hir.)
	<i>Katakana</i> (Kat.)
	<i>Kanji</i> (Kan.)
Vocabulary Level	Level 1 (L1) (easiest)
	Level 2 (L2)
	Level 3 (L3)

⁸ <http://jreadability.net/>.

Level 4 (L4)
Level 5 (L5)
Level 6 (L6) (most difficult)

3.3 Statistical Techniques

This study primarily applied multiple regression analysis as an analytic method whose purpose is to explain and predict a criterion variable from multiple explanatory variables. The statistical method can be used to *identify* the explanatory variables that are related to the criterion variable, to *describe* the relationships between these two types of variables, and to provide an equation for the *prediction* of the criterion variable from the explanatory variables (Kabacoff 2011). In this study, explanatory variables consist of parts of speech, word types, character types, and vocabulary levels, whereas criterion variables represent the year that a song ranked in the top twenty titles selected by the annual Oricon single chart. Before implementing multiple regression analysis, we identified several pairs of variables that showed a high correlation with each other, and carried out stepwise variable selection based on the Akaike Information Criterion (AIC) to deal with potential multicollinearity.

Regression modeling is instrumental in capturing the chronological changes in language data. Using statistical modeling, S. Tsukamoto (2004) showed that the year of publications of English prose written between the sixteenth and twentieth centuries could be predicted by the frequencies of *wh*-determiners, *been*, and adjectives. Jin (2009) also pointed out the strong relationship between the year of publications and the frequencies of nominative particles and conjunctive particles in the writings of the famous Japanese novelist Ryunosuke Akutagawa.

4. Results and Discussion

4.1 Correlation Analysis

The present study began with investigating correlations among all variables, including criterion variables, by calculating the Pearson’s product moment correlation coefficient (*r*). Table 3 lists the top ten high correlation pairs. As this table shows, the highest-correlation pair among lexical indices is that of Japanese-origin words and Chinese-origin words (*r* = -0.99), following particles and other parts of speech (*r* = -0.98) and foreign-origin words and *katakana* (*r* = 0.89). The lexical index that has the highest correlation with the year of song popularity is *kanji* (*r* = 0.78).

Table 3. Correlations between variables (top 10)

Rank	Variable 1	Variable 2	<i>r</i>
1	Japanese-origin	Chinese-origin	-0.99
2	Particle	Other	-0.98
3	Foreign-origin	<i>Katakana</i>	0.89
4	Verb	Other	-0.89
5	Verb	Particle	0.87
6	Pronoun	Other	-0.85
7	Particle	Pronoun	0.83
8	Auxiliary verb	Other	-0.78
9	<i>Kanji</i>	Year	0.78
10	Particle	Auxiliary verb	0.75

4.2 Multiple Regression Analysis

The next step was to describe the chronological shift in the usages of lexical indices in lyrics by applying multiple regression analysis. Given the highly correlated pairs identified in the previous correlation analysis, a stepwise variable selection using AIC was implemented to cope with the multicollinearity problem. As a result, sixteen variables were selected: (a) adjectival noun, (b) auxiliary verb, (c) conjunction, (d) pronoun, (e) verb, (f) adverb, (g) adnominal, (h) level 2 vocabulary, (i) level 3 vocabulary, (j) level 4 vocabulary, (k) *hiragana*, (l) *katakana*, (m) Japanese-origin word, (n) Chinese-origin word, (o) foreign-origin word, and (p) hybrid word (see table 4).

Table 4. Results of multiple regression analysis

	Estimate	Standard Error	<i>t</i> value	<i>p</i> (> <i>t</i>)	Significance
(Intercept)	-2.900e+04	1.304e+04	-2.23	0.04	*
Adjectival noun	-7.820e+00	3.623e+00	-2.16	0.04	*
Auxiliary verb	3.072e+00	1.047e+00	2.93	0.01	**
Conjunction	-3.879e+01	1.672e+01	-2.32	0.03	*
Pronoun	-2.577e+00	1.795e+00	-1.44	0.16	
Verb	-1.917e+00	9.938e-01	-1.93	0.07	

Adverb	4.255e+00	2.470e+00	1.72	0.10	
Adnominal	6.195e+00	5.343e+00	1.16	0.26	
Level 2	1.544e+02	5.981e+01	2.58	0.02	*
Level 3	1.902e+02	7.471e+01	2.55	0.02	*
Level 4	1.301e+02	7.347e+01	1.77	0.09	
<i>Hiragana</i>	-1.502e+00	9.226e-01	-1.63	0.12	
<i>Katakana</i>	-2.263e+00	9.060e-01	-2.50	0.02	*
Japanese-origin	3.099e+02	1.298e+02	2.39	0.03	*
Chinese-origin	3.132e+02	1.309e+02	2.39	0.03	*
Foreign-origin	3.115e+02	1.306e+02	2.39	0.03	*
Hybrid	3.010e+02	1.299e+02	2.32	0.03	*

Notes. The columns in this table signify the following: “Estimate” shows regression coefficients; “Standard Error” means standard deviation of variables; “*t* value” is the result of the *t*-test based on the null hypothesis that a regression coefficient equates to 0; “*p* ($>|t|$)” is called the *p* value calculated from the *t* value; and “Significance” shows the significance level (** = $p < 0.01$, * = $p < 0.05$). “Intercept” refers to the formula of regression line.

The coefficient of determination was 0.93, and the adjusted coefficient of determination was 0.83, showing that the null hypothesis that all regression coefficients are 0 was rejected ($F = 21.98$). It was found that there was a strong relationship between the year of song popularity and lexical usage rates of adjectival noun, auxiliary verb, conjunction, level 2 vocabulary, level 3 vocabulary, *hiragana*, *katakana*, Japanese-origin word, Chinese-origin word, foreign-origin word, and hybrid word, by observing the *p* values of the regression coefficients ($p < 0.05$). What is to be noted is that all four categories of word types have a significant connection with the timing of song popularity. As has already been mentioned above, regression modeling can be exploited to predict the criterion variable from the explanatory variables as well as to describe the relationships between explanatory and criterion variables. Therefore, we predicted the year of song popularity by applying multiple regression analysis based on lexical indices. Given the sample size of our dataset (858 songs), two-thirds of the randomly selected data were utilized to generate a statistical model for the prediction of the year, whereas the other one-third was used to validate the model. The results of the analysis showed that the coefficient of determination and adjusted coefficient of determination were 0.92 and 0.86, respectively, while the *F* value was 16.58. The average difference between the actual and predicted year of song popularity was only 5.75. The results clearly demonstrate that the methodology of combining lexical indices and regression analysis is effective in

tracking the chronological changes in language use in lyrics.

4.3 Chronological changes in lexical indices

The results of multiple regression analysis (see table 4) show that there was a strong relationship between lexical usage (e.g., Japanese-, Chinese-, and foreign-origin words) and the year of song popularity. This section, therefore, closely observes the chronological shift of lexical indices. To begin with, figure 1 shows the chronological changes in the usages of Chinese-origin words from 1977 to 2015.⁹ The horizontal axis shows years, whereas the vertical axis signifies the relative frequency of usage. It can be seen that the usage of Chinese-origin words gradually increases over time. By contrast, non-Chinese foreign-origin word usage decreases after 1990, although it increases again in 2010. Moreover, frequency change patterns in word types corresponded with those in character types. As figures 3 and 4 elucidate, the relative frequency of *kanji* has a gradual rise, whereas that of *katakana* has a considerable fall after 1990.¹⁰

Figure 1. Chronological shift in the relative frequency of Chinese-origin words

⁹ The relative frequency of Chinese-origin words in 1976 can be regarded as an outlier that blurs the frequency change pattern over the past four decades (see appendix B). Thus, we did not use the frequency of the year for the visualization in figure 1.

¹⁰ The increase of *kanji* may be a general tendency that is partially due to the widespread use of word processors.

Figure 2. Chronological shift in the relative frequency of foreign-origin words

Figure 3. Chronological shift in the relative frequency of *kanji*

Figure 4. Chronological shift in the relative frequency of *katakana*

Qualitative analysis of the lyrics of hit songs highlights the decline of foreign-origin words and *katakana*. These linguistic features were more frequently used in the 1970s and 80s than in later decades. For example, *Julia ni Heartbreak* (Heart broken by Julia) by Checkers (the top single on the 1985 Oricon chart) and *CHA-CHA-CHA* by Akemi Ishii (the top single in 1986) displayed the large number of foreign-origin words and *katakana*:¹¹

- (1) キャンドル・ライト (candlelight) が
ガラス (glass) のピアス (earrings) に反射けて滲む
 お前彼の腕の中踊る
傷心 (ハートブレイク) (heartbreak) Saturday Night
悲しいキャロル (carol) がショーウインドウ (show window) で
 銀の雪に変わったよ
 (*Julia ni Heartbreak*)
- (2) 街で噂の
 辛くち
セクシー・ギャル (sexy girl)
 甘い誘い
 はねつける
スパイシー・ギャル (spicy girl)
花の金曜日 (ウィークエンド) (weekend)
 匂いもファンキー・ナイト (funky night)

¹¹ Foreign-origin words in Japanese lyrics were highlighted in underlines.

(CHA-CHA-CHA)

Recently, however, J-pop songs have not used either foreign-origin words or foreign languages with a high level of frequency in their lyrics, even though the titles are in English, such as *Believe* by Arashi (the top single in 2009) and *Beginner* by AKB48 (the top single in 2010). Furthermore, the titles of seventeen songs by Ayumi Hamasaki charted in the top twenty from 1999 to 2005 were all in English,^{1 2} but the frequencies of foreign-origin words and foreign languages are very low in the lyrics, which made them rather classical in style (Misaki 2002).

The changes in the usage of word and character types reflect changes in some values among Japanese people. During the 1970s and 1980s, foreign languages and foreign-origin words were used to create “cool” Western images that many Japanese people admired. However, as Japanese popular culture matured, the use of these indices has declined. A dramatic change in the usage of word and character types occurred around 1990, when the Showa era ended and the bubble economy burst in Japan—a turning point in cultural trends that corresponds with historically significant political and economic events. Additionally, the increase of Japanese- and Chinese-origin words in popular songs may be connected with the Galapagos syndrome of the Japanese music industry as well as the rightward trends seen in Japanese youth culture after the 1990s.

Another noteworthy shift in the language use of Japanese popular songs can be seen in the vocabulary levels used in the lyrics. As regression coefficients shown in table 4 indicate, the proportions of level 2 and 3 words in Japanese popular songs significantly increased over the past four decades, which represents a decrease in the proportions of more difficult words. In addition, the results of regression analysis show an increase in adjectival nouns and conjunctions and a decrease in auxiliary verbs. These trends in the use of parts of speech represent the preference for conveying emotion and feelings instead of describing concrete episodes in the lyrics.

5. Conclusion

This study compared the usages of 26 lexical indices in 858 Japanese popular songs released in a forty-year period from 1976 to 2015, and investigated the chronological shifts in language usage. The results showed that the frequencies of different word types and character types changed drastically before and after 1990. Particularly, it was shown

^{1 2} One of them, “A Song Is Born,” produced in 2002, was a duet with KEIKO. Two songs in a single album were counted as one.

that the frequencies of foreign-origin words and *katakana* diminished, while the frequencies of Chinese-origin words and *kanji* increased. Concerning parts of speech and vocabulary levels, the usages of auxiliary verbs as well as level 2 and 3 words became more prominent, whereas the frequencies of adjectival nouns and conjunctions decreased. These outcomes are derived from systematic data and statistical methods, thus providing objective resources for sociological research on Japanese contemporary culture. For further research, it is necessary to consider both the music genres and the genders of the singers, considering how lyrics vary according to these elements (Kitagawa 1999). What is more, topic modeling can be useful for carefully examining the social and historical backgrounds within which each song was created.

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Appendix A. The relative frequencies of parts of speech

Year	Parts of speech												
	Int.	Ad.N	Adj	Par.	Au.V.	Con.	Pro.	Ver.	Adv.	Pr.N.	Co.N.	And.	Oth.
1976	0.59	2.49	2.49	32.72	10.65	0.11	6.45	11.87	2.56	0.78	24.81	0.67	3.82
1977	0.88	1.21	2.46	27.51	8.76	0.02	4.58	9.43	1.94	0.76	21.19	0.88	20.36
1978	0.73	1.33	2.47	29.30	8.71	0.13	4.94	9.12	2.02	0.73	22.54	0.67	17.29
1979	0.30	0.70	2.08	24.50	5.56	0.12	3.60	9.26	1.71	0.61	22.05	0.70	28.81
1980	0.44	1.48	2.79	29.20	7.56	0.09	4.14	10.35	1.82	0.21	23.73	1.26	16.95
1981	0.22	1.36	3.02	25.13	6.14	0.13	3.19	8.75	1.81	0.79	21.92	0.55	27.00
1982	0.37	1.27	2.88	25.82	7.18	0.18	3.45	8.77	1.83	0.55	22.05	0.58	25.06
1983	0.15	1.39	3.08	25.90	8.57	0.08	3.38	9.10	2.21	0.83	21.69	0.64	22.98
1984	0.69	1.40	2.23	24.87	7.85	0.09	2.73	8.78	1.95	0.82	24.14	0.52	23.95
1985	0.31	0.60	1.81	19.03	6.28	0.20	2.48	6.95	0.98	0.37	19.08	0.51	41.40
1986	0.30	1.08	1.57	19.04	5.62	0.13	2.18	6.69	1.27	0.29	20.80	0.63	40.42
1987	0.12	1.33	2.29	24.47	8.20	0.15	2.64	9.91	1.34	0.28	21.15	0.60	27.52
1988	0.38	1.18	2.48	23.74	8.41	0.08	3.23	9.43	1.60	0.42	20.41	0.78	27.86
1989	0.18	0.82	2.44	23.64	7.31	0.09	2.66	9.00	1.43	0.19	21.56	0.78	29.90
1990	0.60	0.88	1.73	20.68	6.35	0.02	2.13	7.63	1.76	0.47	18.85	0.65	38.24
1991	0.22	1.18	1.77	21.38	7.13	0.11	3.08	8.33	2.12	0.20	19.34	1.01	34.13
1992	0.13	1.43	2.34	25.24	8.80	0.11	4.03	9.35	2.14	0.09	19.94	0.75	25.65
1993	0.18	1.69	2.69	25.66	9.35	0.15	3.84	10.71	2.39	0.27	19.76	1.01	22.29
1994	0.13	1.28	2.47	23.49	8.77	0.15	3.54	8.47	1.58	0.15	16.99	0.86	32.13
1995	0.38	1.18	2.64	25.93	9.25	0.17	3.80	9.18	2.27	0.18	21.62	0.80	22.59
1996	0.22	1.11	2.45	21.75	7.59	0.10	3.05	7.93	1.58	0.30	17.62	0.77	35.53
1997	0.14	1.44	2.81	24.60	8.70	0.06	3.32	8.55	1.58	0.20	17.89	0.63	30.08
1998	0.22	1.44	2.86	25.97	9.89	0.09	3.28	10.97	1.68	0.14	20.49	0.90	22.08
1999	0.27	1.27	3.23	23.34	8.65	0.07	2.78	8.38	2.15	0.19	18.45	0.77	30.44
2000	1.37	1.44	1.76	18.77	7.13	0.09	2.48	6.37	1.76	0.19	17.14	0.85	40.63
2001	0.41	0.96	2.53	23.60	8.62	0.17	3.57	8.36	3.36	0.12	20.29	0.86	27.16
2002	0.31	0.78	1.72	18.15	5.54	0.16	2.80	6.89	2.09	0.26	16.91	1.12	43.28
2003	0.64	1.28	2.95	31.18	10.18	0.30	4.89	10.73	3.05	0.23	21.15	1.30	12.13
2004	0.29	1.62	2.96	24.83	9.06	0.11	4.52	9.76	2.42	0.18	21.29	1.03	21.92
2005	0.54	0.77	1.93	21.91	7.42	0.14	3.16	8.90	1.61	0.36	19.46	1.00	32.80
2006	0.21	1.19	2.30	27.03	9.50	0.08	4.24	10.80	1.96	0.25	19.30	1.03	22.12

2007	1.32	1.15	2.49	25.75	8.63	0.05	3.63	10.75	3.06	0.72	18.98	1.00	22.47
2008	0.44	1.11	2.00	23.52	7.90	0.10	3.71	8.90	2.20	0.63	19.76	1.06	28.68
2009	0.42	1.29	2.22	24.75	8.96	0.11	3.70	10.09	2.10	0.17	19.47	1.07	25.64
2010	0.15	1.02	1.37	18.10	5.98	0.09	2.90	6.89	1.72	0.11	17.72	0.78	43.17
2011	0.23	1.33	2.01	24.00	8.30	0.09	3.79	8.04	2.47	0.60	18.98	1.02	29.15
2012	0.18	1.19	2.05	21.14	8.34	0.07	2.95	7.37	2.23	0.22	18.87	1.00	34.38
2013	0.34	1.22	2.44	23.65	8.76	0.04	3.12	8.87	1.93	0.13	20.90	1.22	27.38
2014	0.24	1.77	3.23	31.15	11.70	0.12	4.32	10.73	1.87	0.26	22.21	0.76	11.63
2015	0.28	0.92	2.26	25.23	9.26	0.09	3.39	9.07	2.07	0.20	19.23	1.01	26.99

Appendix B. The relative frequencies of word types, character types, and vocabulary level

Year	Word types				Character types				Vocabulary levels					
	Jap.	Chi.	For.	Hyb.	Hir.	Kat.	Kan.	L1	L2	L3	L4	L5	L6	
1976	27.88	63.55	4.83	3.25	68.39	10.28	21.33	0.37	0.22	0.22	0.14	0.05	0.01	
1977	89.77	6.55	2.31	1.37	68.10	8.94	22.96	33.28	22.20	22.37	16.02	4.89	1.25	
1978	88.40	6.61	4.10	0.89	67.91	10.63	21.47	30.85	22.64	21.97	16.71	6.54	1.29	
1979	90.51	5.48	3.08	0.93	68.86	7.44	23.70	29.66	25.47	21.89	15.46	6.78	0.73	
1980	90.73	5.80	1.71	1.77	70.25	4.64	25.12	28.53	26.24	21.92	17.47	5.09	0.76	
1981	88.18	6.26	4.74	0.82	64.84	11.54	23.62	28.41	23.16	22.29	18.58	6.85	0.72	
1982	87.54	7.53	3.62	1.30	64.78	11.01	24.20	27.57	23.01	23.65	18.28	6.73	0.77	
1983	89.13	7.13	2.33	1.41	66.54	8.33	25.13	30.36	24.48	21.08	16.86	6.02	1.19	
1984	86.43	7.70	4.04	1.83	63.75	12.33	23.92	29.52	24.24	21.83	17.24	6.44	0.72	
1985	89.01	5.74	4.05	1.19	66.63	10.11	23.26	27.22	23.12	24.67	18.44	5.85	0.71	
1986	86.38	6.62	5.17	1.82	62.71	12.43	24.86	26.23	21.76	23.65	20.67	6.57	1.13	
1987	89.45	6.36	2.91	1.28	69.03	6.54	24.43	25.17	22.53	24.14	20.57	6.51	1.07	
1988	89.97	6.48	2.02	1.53	70.07	5.54	24.38	24.84	22.33	26.31	17.90	7.22	1.40	
1989	89.43	6.99	2.01	1.57	70.60	5.36	24.05	29.41	22.51	21.30	17.66	8.30	0.81	
1990	88.92	6.42	3.60	1.06	64.52	13.42	22.06	27.12	23.20	24.41	18.48	6.26	0.52	
1991	88.42	7.90	1.91	1.76	68.38	8.15	23.46	25.64	26.04	24.59	16.87	6.64	0.22	
1992	88.62	7.77	1.90	1.70	68.47	5.09	26.44	27.15	27.91	22.44	17.32	4.63	0.55	
1993	88.37	8.32	1.97	1.34	67.87	5.70	26.43	28.10	23.46	23.57	17.60	6.55	0.72	
1994	89.79	7.55	1.12	1.54	70.57	3.11	26.32	27.18	26.06	23.06	17.91	5.48	0.30	
1995	88.35	8.32	2.11	1.22	69.19	6.21	24.60	29.00	25.52	22.82	15.77	6.21	0.68	
1996	90.18	7.54	1.07	1.20	71.15	5.13	23.72	28.35	25.40	22.82	16.56	6.26	0.60	
1997	89.15	7.86	1.52	1.46	70.95	6.12	22.93	28.31	26.58	22.07	16.63	5.64	0.78	

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1998	88.69	8.34	1.53	1.44	69.52	5.29	25.19	25.87	25.57	23.13	17.76	7.04	0.63
1999	89.00	8.42	1.05	1.52	70.89	3.94	25.17	28.46	26.08	23.10	16.35	5.36	0.66
2000	89.00	7.91	1.64	1.45	68.33	6.10	25.57	27.89	24.83	23.48	18.08	5.04	0.67
2001	86.80	10.11	0.86	2.23	69.10	6.02	24.87	26.73	24.84	23.47	19.16	5.54	0.26
2002	87.58	10.35	0.96	1.11	68.54	3.12	28.33	32.94	23.84	21.46	15.94	5.61	0.22
2003	90.40	7.61	1.12	0.87	69.39	3.84	26.77	28.65	27.40	22.39	15.19	5.56	0.82
2004	88.99	8.06	1.56	1.40	67.22	6.22	26.56	24.48	27.41	23.83	17.89	5.65	0.73
2005	87.17	9.29	2.17	1.37	64.43	7.54	28.04	27.69	24.34	22.42	18.72	5.69	1.14
2006	89.66	8.20	1.09	1.06	68.17	4.44	27.39	26.03	24.70	22.61	20.56	5.63	0.47
2007	86.34	9.42	2.19	2.05	66.17	6.92	26.91	28.21	24.85	22.73	16.65	6.84	0.72
2008	87.56	8.52	2.62	1.30	66.00	8.06	25.94	29.58	23.52	24.42	17.71	4.32	0.45
2009	89.18	8.26	1.50	1.06	67.68	4.78	27.53	25.59	26.11	23.09	19.06	5.63	0.53
2010	88.61	8.98	1.06	1.35	68.25	4.13	27.62	25.87	25.03	24.00	19.33	5.40	0.37
2011	86.41	9.96	2.22	1.41	65.20	9.18	25.62	27.85	23.99	24.47	18.22	5.04	0.42
2012	87.28	8.12	3.26	1.34	65.08	8.59	26.33	28.02	25.10	22.27	18.89	5.33	0.38
2013	84.10	11.00	3.55	1.35	62.04	10.10	27.86	0.24	0.26	0.23	0.19	0.07	0.01
2014	86.52	10.33	2.02	1.14	65.90	6.37	27.72	0.27	0.25	0.24	0.18	0.06	0.01
2015	86.59	9.09	3.19	1.13	65.30	8.07	26.62	0.27	0.26	0.23	0.18	0.06	0.00