

Rhythmic alternation and the noun-verb stress difference in English disyllabic words

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1. Introduction

The aim of this paper is to update the evidential data for the noun-verb stress difference in English disyllabic words and to indicate a possible relationship between the strong-weak (henceforth S-W) rhythmic alternation and the noun-verb stress difference. First, I will explain that the English language has a S-W rhythmic alternation. English prosodic rule is greatly affected by the alternation. Next, the updated evidence for the noun-verb stress difference will be presented through an analysis of a machine readable database. Finally, the possibility that the noun-verb stress difference derived from the S-W rhythmic alternation is discussed.

2. Stress-timed rhythm in English

Every language in the world has its own rhythm. Linguistic rhythm is created by composing rhythmic units with a certain component in speech sounds and producing the rhythmic units repeatedly at almost regular intervals. Depending on the differences of the components making rhythmic units, linguistic rhythm is classified into three categories: stress-timed rhythm, syllable-timed rhythm and mora-timed rhythm. In a stress-timed language like English, German, and Russian, the repeated occurrence of stress forms the rhythmic units, and the durations of inter-stress intervals are maintained relatively constant (Carr, 1999; Ladefoged, 1993; Roach, 1991). This is called the isochrony of inter-stress interval.

The study of the rhythmic structure of English verse greatly contributes to the development of the study of stress-timed rhythm in more prosaic English. Although scrupulous analyses show more profound structures (see e.g. Kiparsky, 1977; Leech, 1969), there is a relatively simple but robust rule dominating the whole rhythmic structure of English verse. That is

the alternation of strong and weak beats (Kubozono & Mizokoshi, 1991; Leech, 1969). Shapiro & Beum (1965) actually note that over 90% of English verse written after fifteenth century is iambic. Many linguists suppose that the S-W rhythmic alternation is not a phenomenon observed only in English verse but the principle is a fundamental structure also in more prosaic usage of English.

In English, which is a stress-timed language, every word is not equally stressed but some groups of words are stressed more frequently than others (Ladefoged, 1993; Roach, 1991). The main factor determining the difference is the distinction between content and function words. In principle, content words, which convey more semantic information than function words, are stressed, while function words are only stressed in particular situations. The inter-stress intervals are adjusted not only by prominence of stressed syllables but also by sound change such as reduction, linking, assimilation, and omission of unstressed syllables to form stress-timed rhythm. For instance, *She went to the restaurant to see her friend.* is pronounced as [ʃɪ 'went tə ðə 'restrɒnt tə 'sɪ: hə 'frend]. The function word *she* is here pronounced in the weak form [ʃɪ] not in the strong form [ʃi:]. Likewise, *to*, *the*, and *her* are pronounced in their weak forms. This distinction is the basis of the S-W alternation.

The number of syllables in the inter-stress interval is not always equal as is seen in an example given by Pike (1945).

(1a) English is easy.

(1b) English is very easy.

Languages of stress-timed rhythm are theoretically viewed as having almost the same duration in the inter-stress intervals. Measuring the actual duration, however, there are considerable variances (e.g. Roach, 1982; see Lehiste, 1977 for further discussion). Out of

(1a) and (1b), to be more precise, the duration from the first syllable of *English* to that of *easy* of (1b) is longer than (1a). In other words the isochrony of the inter-stress interval is a physically questionable concept. Nevertheless, as Kohno (2001) suggests, the isochrony of the inter-stress interval is recognised as a psychological concept. Because listeners can perceive 7 ± 2 syllables holistically as long as the duration between syllables is within 330ms, listeners perceive the isochrony of inter-stress interval even if the actual duration varies to some extent (see Kohno, 2001 for further information). And the psychological aspect of the isochrony of the inter-stress makes English a stress-timed language.

3. Evidences for stress-timed rhythm in English

Evidence for stress-timed rhythm is abundantly found in English itself. The word orders of idiomatic phrases can be explained by the S-W alternation. Among the phrases (2a) to (3b), (2a) and (3a) are more general than (2b) and (3b) because they are more euphonic. Actually, according to the British National Corpus, (2a) appears 99 times per a million words, while (2b) appears only 23 times. Likewise, (3a) appears 272 times per a million words, while (3b) appears only 29 times. Kubozono & Mizokoshi (1991) mentions that such euphony derives from the rhythmic alternation. Phrases (2a) and (3a) retain the S-W alternation but phrase (2b) and (3b) do not. This makes phrase (2a) and (3a) rhythmically more preferable.

- (2a) TEA or COFfee [SWSW]
- (2b) COFfee or TEA [SWWS]
- (3a) TIME and MONey [SWSW]
- (3b) MONey and TIME [SWWS]

Phrases in brackets in sentence (4a) to (5b) are examples of a pair of binomials. Bolinger (1962) asked 17 native speakers of English to pronounce some

stimulus sentences in the same rhythmic contexts as the examples and judge which one sounds smoother and better. As a result, over ninety percent of participants replied (4a) type sentences are smoother than (4b). This is because phrase (4a) maintains the S-W alternation but (4b) does not. Furthermore, the following syllable of phrase (4a) is stressed. Accordingly, (4a) keeps the S-W alternation also after the binomial. This makes the sentence quite preferable in terms of the rhythmic structure. Likewise, out of (5a) and (5b), over eighty percent of participants chose (5a), which maintains the S-W alternation within the phrase. Since the following syllable of phrase (5a) is unstressed, the rhythmic structure of (5a) after the binomial varies from the S-W alternation. Consequently, the proportion decreased slightly by approximately ten percent compared to (4a).

- (4a) The chairman made a <SHORT and SIMple> STATEment. [SWSW]
- (4b) The chairman made a <SIMple and SHORT> STATEment. [SWWS]
- (5a) The chairman made a <SHORT and SIMple> explaNAtion. [SWSW]
- (5b) The chairman made a <SIMple and SHORT> explaNAtion. [SWWS]

Some irregular word orders can also be explained by the rhythmic alternation. Bolinger (1965) presents intensive adverbs *quite* and *such* as examples. The regular word order of article and adverb is <article + adverb + adjective + noun> as seen in (6a). On the other hand, the word order of (6b) <adverb + article + adjective + noun> is not generally acceptable. A monosyllabic adverb *quite*, however, accepts both word orders as represented by (7a) and (7b). Because, in case of (7a), a S-S sequence is induced between *quite* and *long*, (7b) is accepted to avoid the S-S sequence and to maintain the principle of S-W alternation. Likewise, adverb *such* takes irregular word order. The word order of (8b) is ungrammatical because of

the violation of the principle of S-W alternation. As a solution for the violation, the order of article and adverb is alternated.

- (6a) a VERy LONG report [WSWSWS]
- (6b) * VERy a LONG report [SWWSWS]
- (7a) a QUITE LONG report [WSSWS]
- (7b) OUIITE a LONG report [SWSWS]
- (8a) a VERy PRETty girl [WSWSWS]
- (8b) * a SUCH PRETty girl [WSSWS]
- (8c) SUCH a PRETty girl [SWSWS]

There is other evidence for stress-timed rhythm in English such as stress pattern of phrasal verbs (Watanabe, 1992), the insertion of redundant words, contraction of words (Bolinger, 1965), speech errors (Cutler, 1980), and insertion or omission of the complementizer *that* (Lee & Gibbons, 2007). All this evidence demonstrates that English is a stress-timed language.

4. Adjustment to stress-timed rhythm

The S-W rhythmic alternation is significant in English stress-timing not simply because it is preferred by native speakers but because it governs speech production and perception by native speakers. What is important here is that linguistic rhythm is, as I mentioned earlier, both a physical and psychological phenomenon. Allen (1975) explains the psychological mechanism underlying linguistic rhythm. He notes that when participants listen to a series of stimulus with the physically same quality such as beeps, they do not simply perceive them as a series of monotonous stimulus. They divided them into groups consisting of two to six stimuli, and perceive the first stimulus within a group as 'louder and more prominent'. Martin (1970) reports a comparable phenomenon in English stress-timing. Even if the rhythmic alternations are not physically observed in the presented speech stimuli, listeners report that they do perceive it.

Not only listeners but also speakers are governed by

the rhythmic alternation. They try to adjust their speech prosody in order to abide by the S-W alternation if it varies from the principle. A notable example is stress shift¹ (Allen, 1975; Liberman & Price, 1977; Schane, 1979). Let's take a look at (9). The word *thirteen* in isolation has the second syllable stress. When a monosyllabic word *men* follows it, however, the primary stress of *thirteen* shifts to the first syllable to avoid a S-S sequence.

- (9) thirTEEN [,θɜ:ˈti:n] → THIRteen MEN

This phenomenon is also observed by some types of derivational affixation (Schane, 1979). For instance, the word *solid* in isolation has first syllable stress. When the suffix *-ity* is added, however, the primary stress of *solidity* is placed on the second syllable to avoid a W-W sequence.

- (10) solid ['sɒlɪd] → solidity [səˈlɪdəti]

5. The noun-verb stress difference in English

As is well-known, lexical stress patterns in English, in particular those of disyllable words, are closely associated with grammatical category such as noun and verb. The majority of disyllable nouns have stress on the first syllable, while disyllable verbs have stress on the second syllable. This is called stress typicality. For instance, the noun *gender*, which has trochaic stress, is a typically stressed noun, and *guitar*, which has iambic stress is an atypically stressed noun. Likewise, the verb *prevent*, which has iambic stress pattern, is a typically stressed verb, and *publish*, which has trochaic stress pattern, is an atypically stressed verb.

A clear example of this is noun-verb homographs (e.g. *record*, *permit*, *survey* etc; Sherman, 1975). These homographs function as nouns if they have trochaic stress, whereas these function as verbs if they have iambic stress. In sentence (11), for example, *record* is

a noun and is pronounced as ['rekɔ:d], while in sentence (12), *record* is a verb and is pronounced as [r'kɔ:d].

- (11) I bought a record at the store.
- (12) I recorded the concert.

Table 1. Stress typicality of disyllable noun and verb in English

researcher	category	result
Sereno (1986)	noun	out of 1425 nouns, 93% are trochaic
	verb	out of 523 verbs, 76% are iambic
Kelly & Bock (1988)	noun	out of 3002 nouns, 94% are trochaic
	verb	out of 1021 verbs, 69% are iambic

As shown in table 1, Sereno (1986) and Kelly & Bock (1988) present statistical evidence for the stress typicality from the different types of corpora. These data shows that the stress typicality does exist. However, the data size is rather small, since these data were collected from limited databases. These therefore required updating using a larger-sized database.

The updated analysis was conducted through the MRC psycholinguistic database (Coltheart, 1981; Wilson, 1988). The procedure of their analysis is the following. First, all disyllabic words were collected from the database regardless of grammatical category. Second, the collected data was imported to spreadsheet software. Third, since the MRC database sets up respective items in case the words belong to more than one category, the items were unified based on the following three criterions:

1. if both singular and plural were disyllabic, plurals were eliminated (e.g. churchman / churchmen, linesman / linesmen).
2. if two types of spelling were listed, British

spellings were eliminated (e.g. apprise / apprise, center / centre).

3. contractions and abbreviation (e.g. hadn't, hap' orth, incog.) were eliminated.

Fourth, the number of pure nouns and pure verbs² was counted. Fifth, the number of typically stressed pure nouns and pure verbs was counted. The difference between base words and derived words (e.g. greenhouse, mankind) was not considered.

The result is largely consistent with the previous research. The total number of the extracted words is 10894. Table 2 shows the classification of the extracted words based on grammatical category. If a word belongs to more than one category, the word was counted redundantly in each category. The proportion of pure nouns and verbs in the total nouns and verbs is shown in table 3. Out of total of 10894 words, 5818 are pure nouns and 1322 are pure verbs. Among the nouns and verbs, 5358 nouns (92.09%) and 860 (65.05%) verbs are typically stressed, and 408 nouns and 324 verbs are atypically stressed (see table 4). Eliminating 'others' from consideration to adjust the criteria of the previous data, 92.92 percent of nouns and 72.64 percent of verbs are typically stressed. This result reaffirms that the majority of disyllabic nouns possess trochaic stress and verbs iambic tress.

Table 2. The classification of the extracted words based on grammatical category

noun	7326
verb	2501
adjective	2420
adverb	291
preposition	68
conjunction	21
pronoun	15
interjection	37
past participle	57
others	108

Table 3. The proportion of pure nouns and verbs in the total nouns and verbs

category	actual number	percentage
pure nouns / nouns	5818 / 7326	79.42%
pure verbs / verbs	1322 / 2501	52.86%

Table 4. Stress pattern of pure noun and verb

category	stress pattern	actual number	percentage
nouns	trochaic	5358	92.09%
	iambic	408	7.01%
	others	52	0.89%
verbs	trochaic	324	24.51%
	iambic	860	65.05%
	others	138	10.44%

* Shaded columns indicates typical stress pattern.

6. Rhythmic alternation and the noun-verb stress difference

The principle of rhythmic alternation might explain the noun-verb stress difference (Kelly, 1988 and Kelly & Bock, 1988). Kelly & Bock (1988) hypothesise that nouns occur more frequently in a context in which they are likely to be stressed trochaically, and verbs in a context in which they are likely to be stressed iambically. Let's take (13) and (14) as examples. The blank in sentence (13) is presumed to be a noun since it is preceded by the article *the*, and followed by the verb *kissed*. If the blank is filled with a disyllabic noun, the noun appears to be stressed trochaically since it is preceded by unstressed *the*, and followed by trochaically stressed *kissed*. If this is the case, the noun follows the optimal rhythmic alternation. A blank in sentence (14) is presumed to be the verb since it is preceded by the noun *boy*, and followed by an article *the*. If the blank is filled with a disyllabic verb, the verb appears to be stressed iambically since

it is preceded by a monosyllabic noun *boy*, and followed by unstressed *the*. If this is the case, the verb follows the optimal rhythmic alternation.

(13) The ____ kissed the girl.

(14) The boy ____ the girl.

There is supporting evidence for this assumption. Native speakers of English and highly-proficient learners of English show a significant tendency to assign stress on the first syllable of a pseudoword *ponsect* in the trochaic context such as (15) compared to the iambic context such as (16) (Kelly & Bock, 1988; Amano, 2007).

(15) Slice the *ponsect* slowly.

(16) The birds *ponsect* concern.

Kelly & Bock (1988) analysed written and spoken corpora manually (Bartlett, 1937 and Gold, 1974 respectively) to validate their hypothesis. They examined the rhythmic context surrounding disyllabic nouns and verbs in the corpora. As a result, nouns actually occur more frequently in trochaic contexts than verbs. Likewise, verbs occur more frequently in iambic context than nouns. Specifically, in the written corpus, the proportion of nouns preceded by stressed syllables is significantly lower than that of verbs (14% and 31% respectively; $z = 10.43, p < .001$), and the proportion of nouns followed by stressed syllables is significantly higher than that of verbs (42% and 20% respectively; $z = 11.77, p < .001$). In the spoken corpus, the proportion of nouns preceded by stressed syllables is significantly lower than that of verbs (15% and 18% respectively; $z = 2.94, p < .01$), and the proportion of nouns followed by stressed syllable is significantly higher than that of verbs (24% and 17% respectively; $z = 5.80, p < .01$). These results are consistent with the dominance of trochaic stress among disyllabic nouns and iambic stress among disyllabic verbs.

Kelly (1988) points out that inflections can also be a factor to assign trochaic stress to disyllabic nouns and

iambic stress to disyllabic verbs. In case of nouns, genitive or plural inflection *-es* adds a syllable to a noun but *-s* does not. In case of verbs, inflection *-es*, *-ing* and *-en* adds a syllable to a verb, and *-ed* also adds if the word final consonant is /t/ or /d/, but *-s* does not. These additional syllables are all unstressed. English disyllabic words might be likely to be stressed on the second syllable to keep W-S-W alternation if these additional unstressed inflections occur frequently. Kelly hypothesises that verbs are likely to inflect additional syllables more frequently than nouns. If this is the case, those inflections may cause verbs to receive iambic stress.

Kelly (1988) analysed the same corpora as Kelly & Bock (1988) manually. They calculated the proportions of disyllabic nouns and verbs with a syllable inflection. The proportions of verbs with a syllable inflection (written 16% and spoken 19%) are significantly higher than nouns (written 0.5% and spoken 1%; written $Z = 14.81$, $p < .001$ and spoken $Z = 16.06$, $p < .001$). In fact, nouns rarely possess an added syllable by inflection, which do not contradict the dominance of trochaic stress among two syllabic nouns.

The corpora analyses by Kelly & Bock (1988) and Kelly (1988) did support their hypotheses. It should not, however, be considered as the conclusive evidence. It is quite difficult to judge whether the presented data decisively explains the reason for the noun-verb stress difference or not. In particular, the spoken data presented by Kelly & Bock (1988), though it indicated statistically significant differences, showed only slight differences.

Kelly (1988) suggests about this that when we take a long history of the English language into consideration, even such slight differences might affect the noun-verb stress difference gradually but steadily. In fact, his explanation is consistent with the history of the noun-verb stress difference. The noun-verb stress difference is not a phenomenon that happens in concert with a particular historical fact such as the Norman Conquest but is originated by the accumulation of sound change which progresses quite

slowly. Sherman (1975) indicates that the change of noun-verb stress pattern progress at the rate of one word per two years.

This kind of sound change is still observed. Kelly (1988) takes *recall* as an example. He says dictionaries show *recall* as having second syllable stress, but it has been obvious especially for people in the American car companies that nominal *recall* has discarded its iambic stress pattern. Consulting pronouncing dictionaries, Kenyon & Knott (1953) show both trochaic and iambic stress for nominal *recall*, while Jones (2006) shows only trochaic for nominal as American pronunciation.

7. Implications for future research

This paper has updated the evidential data for the noun-verb stress difference in English disyllabic words and argued for a possible relationship between the rhythmic alternation and the noun-verb stress difference. The updated evidence has succeeded in reconfirming the existence of the noun-verb stress difference. On the other hand, though the discussions of previous research have partly demonstrated the relationship between the rhythmic alternation and the noun-verb stress difference, it has not been conclusive enough. In future research, updating the evidential data for the relationship could be efficient, but approaches from alternative perspectives might also be needed to show more persuasive evidence.

Notes

1. Although stress shift is recognised as a phonological phenomenon, it is still controversial as a phonetic phenomenon. Analysing acoustical properties, it is difficult to assure that the stress in question literally 'shifts'. As for pitch, which is closely tied to lexical stress in English, the pitch contour between syllables is not completely replaced. Rather, stress shift seems to be perceived or produced by narrowing the difference of pitch contour between syllables (Beckman, de Jong, & Edwards 1988; Grabe, & Warren, 1995).

2. A pure noun is defined as a noun which does not belong to other syntactic categories. Likewise, a pure verb is defined as a verb which does not belong to other syntactic categories.

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