# Differentiated Prosodic Adaption of Chinese and English Poetry: An Acoustic Approach to Reading of Chinese Tang Poetry and Shakespearean Sonnets

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Abstract—This paper explored the prosodic patterns of Chinese and English poetry reading as well as similarities and differences between them, based on the theory of Poetic Function and the Genre-specific Hypothesis. Duration, pitch and intensity patterns of a total of 110 poems read by 5 native English speakers and 6 Chinese native speakers were analyzed and the results demonstrated that both Chinese and English poetry reading realized the rhythm scheme through intensity range, but differed in the adoption of other acoustic cues for other properties respectively. Chinese native speakers applied duration to realize semantic rhythm while English native speakers adopted pitch to realize meter. This paper also has implications for the teaching of poetry reading, improving readers' understanding and appreciation of Chinese and English poetry.

**Index Terms:** Chinese and English poetry reading, acoustic cues, Poetic Function, the Genre-specific Hypothesis

# I. INTRODUCTION

Carl Sandburg [25], a winner of three Pulitzer Prizes writes: "Poetry is a phantom script telling how rainbows are made and why they go away." In other words, poems enjoy a lofty status in culture and, to some extent, change people's understanding of what is going on in the world. Poetry acts as a genre adopting the rhythmic and aesthetic qualities of language to evoke meanings and facilitate chanting [8][16][9]. Classical poetry stands apart from contemporary poetry for its mandatory form [3], especially Chinese Tang poetry in Chinese literature and Shakespearean Sonnets in English literature.

Many workings have investigated the metrical mysteries of Chinese ancient Tang poetry as well as of the Shakespearean Sonnets. Three elements can be amenable to Chinese ancient Tang poetry, i.e. tonal patterns, semantic rhythm and rhyme scheme [3]. First, tonal patterns refer to level (called "ping" in Chinese) and oblique (called "ze" in Chinese) tones categorized in distinction. In Mandarin the first tone (flat, e.g., mā) and the second (rising, e.g., má) are classified as level tones, while the third (falling-rising, e.g. mǎ) and the fourth (short falling, e.g., mà) are oblique tones [11]. Second, semantic rhythm is a pattern of predictable pauses between units within a line [27]. For example, in heptasyllabic poetry, which has eight lines totally and consists of seven syllables in each line, each line creates a pleasurable 4+3 semantic rhythm, which means pauses could be placed between the fourth syllable and the fifth syllable. Third, rhyme scheme is considered as the repetition of the same sound patterns in the same position of verse lines, constituting the beauty of the sound circumlocution [5]. For instance, rhythm scheme appears in the last word of the first, second, fourth, sixth and eighth line in heptasyllabic poems.

As regards the Shakespearean Sonnets, two representative features must be mentioned: meter and rhyme patterns. The meter of Shakespearean verse is iambic pentameter [1], i.e. a rhythmic pattern that combines five sets of alternating unstressed and stressed syllables (feet) in each line [28]. The rhyme scheme of Shakespearean Sonnets is a specific crossed rhyme, consisting of three quatrains (four lines each) for cross rhyme, i.e., abab cdcd efef and a couplet (the two final lines) for double rhyme, i.e., gg.

Poetry reading (or chanting) is a public oral recitation for poetry, which is the way of expression or performance of poetry. Based on the connections between poetic texture and the reading process, Roman Jakobson proposed the theory of the Poetic Function [14], arguing that intrinsic textual features of poems guide the reading process and define the poetry. That is to say, the textual features of a poem are internalized by readers: thus, the innate characters of a poem would have been reflected through the reading process, such as prosodic realizations (acoustic cues) [18][29]. Affected by the theory of Poetic Function, western researchers [26][13] raised a new hypothesis called the Genre-specific Hypothesis, positing that a specific genre leads to a specific reading approach. Accordingly, Chinese Tang poetry and the Shakespearean sonnet would require different reading processes, especially when it comes to prosodic realizations (acoustic cues). Li & Yang [19] investigated the prosodic patterns of a quatrain though phonetic analysis and ERP experiments. However, the participant of [19] was only one person and it only focused on one language (Chinese). Chen & Yang [4] explored the reading process of the rhythm scheme through eye-tracking experiments, only focusing on one language and without carrying out phonetic analysis. Studies about contrasts between Chinese and English poems were limited to experimental proofs for theory [11][15].

On the basis of the Poetic Function theory and of the Genre-specific Hypothesis, therefore, the current study intends to compare the prosodic reading of Chinese Tang Poetry and that of the Shakespearean sonnet in terms of duration, pitch and intensity pattern, investigating, a) the prosodic patterns of Chinese poetry reading, b) the prosodic patterns of English poetry reading, c) similarities and differences between Chinese-English poetry reading.

#### II. METHODS

# A. Participants

Six native speakers of Mandarin (three males and three females) and five native speakers of General American English (three males and two females) took part in our study. All the Chinese speakers belong to the Jianghuai dialect area in the Jiangsu Province. According to individual reports, no native speakers had speech and hearing problems.

# B. Materials

Ten heptasyllabic Chinese Tang poems about patriotism and ten Shakespearean sonnets about love were chosen as stimuli. For heptasyllabic poems, five familiar ones with five unfamiliar ones were exposed to Chinese participants. The metrical tonal patterns of all the heptasyllabic poems started with oblique tones and ended with level tones. For Shakespearean Sonnets, five familiar ones with five unfamiliar ones were demonstrated to American participants while the theme for all sonnets was about romance.

# C. Procedure

Before the normal stimuli were administered, three trial materials (three heptasyllabic poems and three Shakespearean sonnets respectively) were listed to participants aiming to prepare the recording better. Speakers were instructed to understand the stimuli silently before the recording. When the subjects read target poetries out loud, they were all wearing a headset microphone. The distance between the microphone and theirs lips was about two inches. The recorded sentences were digitized onto 44.1 kHz with 16-bit amplitude resolution, directly sampled and analyzed using Praat (www.praat.org).

# D. Data analysis

Three parameters (pitch, duration, intensity range) were extracted from the syllables of Chinese Tang poems and Shakespearean sonnets respectively. For Chinese Tang poems, the duration was calculated from each syllable within each line of a heptasyllabic poem (and intensity range was measured between the maximal and minimal intensity values of last, penultimate and antepenultimate syllable within the first, second, fourth, sixth and eighth line (the rhythm scheme). For Shakespearean sonnets, mean pitch (Z-value) was extracted from ten vowel syllables within each sentence of fourteen lines (iambic) and this intensity range was also counted between maximal and minimal intensity values of the preliminary syllables of rhythm scheme syllable, penultimate and antepenultimate syllable of the rhythm scheme.

A total of 180 sentences (110 poems) were included in the measurement, which made up of 480 sentences (10\*8\*6) from

Chinese speakers and 700 sentences (10\*14\*5) from American speakers. Praat was applied for sentence annotation and analysis. In order to eliminate potential variation caused by speaker gender [21], all pitch values were transferred into Z-values and then normalized and extracted in 10 points (with the exception of voice cracks, which will be removed). Furthermore, R was used to analyze the data and the post hoc test was also employed for comparisons.

#### III. RESULTS

Three acoustic analyses were conducted on parameters of duration, pitch and intensity range for syllables from Chinese Tang heptasyllabic poems and Shakespearean sonnets. For the former, analyses were carried out on duration and intensity range, examining whether Chinese native speakers realized semantic rhythm through prosodic methods, i.e., producing longer duration between the fourth and the fifth syllable than in other syllables of each line and investigating whether Chinese native speakers realize the rhythm scheme of poetry through intensity range, i.e., producing the rhythm scheme syllable with a larger intensity range than the previous syllable of each line. For Shakespearean sonnets, pitch and intensity range were analyzed in order to explore whether American native speakers realize meter (iambic pentameter) through pitch values, i.e., producing unstressed syllables on the first, third, fifth, seventh and ninth position with a smaller pitch pattern than stressed syllables on the second, fourth, sixth, eighth and tenth position of each line. It was also explored whether American native speakers realize rhythm scheme for cross rhythm and couplet through intensity range. For instance, they produced rhythm scheme syllables with a larger intensity range than previous syllables of each line.

"Fig. 1" shows the duration of each syllable in each sentence as read by Chinese native speakers. A one-way analysis of variance (ANOVA) was performed to compare the duration of each syllable in each sentence across syllable positions. One factor was added to the model, i.e., "Syllable position" (one to seven syllable position). The "Syllable position" effect was statistically significant (F (1205) = 138, p< 0.001). A Tukey post-hoc test demonstrated subsequently that the fourth syllable was longer than the other syllables, except the seventh ( $\beta$  (4 - 1) = 0.0705, t (2,716) = 16.7, p <  $0.001, \beta$  (4 - 2) = 0.0695, t (2,716) =16.5, p < 0.001,  $\beta$  (4-3)=0.0808, t (2,716)=19.1, p < 0.001,  $\beta$  (4 - 5) = 0.06949, t  $(2,716) = 16.4555, p < 0.001, \beta (4 - 6) = 0.08632, t (2,716) =$ 20.44, p < 0.001). The seventh syllable was also longer than the other syllables except the fourth ( $\beta$  (7 - 1) = 0.0713, t  $(2,716) = 16.882, p < 0.001, \beta$  (7-2)=0.0703, t  $(2,716)=16.648, p < 0.001, \beta$  $p < 0.001, \beta$  (7-3)= 0.08016, t (2716) = 19.313,  $p < 0.001, (\beta)$  $(7 - 5) = 0.0702, t (2,716) = 16.636, p < 0.001, (\beta (7 - 6) =$ 0.871, t (2,716) = 20.623, p < 0.001). This suggests that Chinese native speakers applied longer duration to the fourth syllable and the seventh syllable, suggesting that they apply prosodic cues of duration for semantic rhythm for 4+3.

"Fig. 2" presents the mean pitch of the first, third, fifth, seventh and ninth syllable as unstressed syllables and that of the second, fourth, sixth, eighth and tenth syllable as stressed syllables in each line of Shakespearean sonnets across stressed types, according to the iambic pentameter rule. Oneway ANOVA showed that with the "Stressed type" factor (stressed and unstressed) was statistically significant. (F (5,907) = 14.8, p < 0.001). The Tukey post-hoc test displayed that the mean pitch of stressed syllables was higher than that of unstressed syllables ( $\beta$  (stressed - unstressed) = 0.0898, t (5,908) = 3.84, p < 0.001). This indicates that American native speakers use a larger pitch pattern in stressed syllables than in unstressed syllables, indicating that American native speakers apply prosodic cues of pitch pattern to realize iambic pentameter.



Fig. 1. Duration of each syllable of different syllable position in each line in heptasyllabic poetry from Chinese native speakers. Asterisks indicate statistical significance:  $p < 0.05^*$ ,  $p < 0.01^{**}$  and  $p < 0.001^{***}$ .

"Fig. 3" illustrates the intensity range of the seventh syllable (rhythm scheme syllable), fifth syllable and sixth syllable within the first, second, fourth, sixth and eighth sentence in heptasyllabic poetry because in this meter the rhythm scheme appears in the first, second, fourth, sixth and eighth sentence. Figure 3 shows that Chinese native speakers adopted a larger intensity range in the seventh syllable (rhythm scheme syllable) in all sentences. The intensity range was analyzed by a one-way ANOVA with one factor, "Group" (sixth and seventh syllable) in the first, second, fourth, sixth and eighth sentence respectively. The results demonstrated that there was a significant effect of "Group" on the first sentence (F (106) = 73.6, p < 0.001), on the second (F (118) = 68.5, p < 0.001), on the fourth, (F (115) = 63.9, p < 0.001)0.001), on the sixth (F (114) = 24.2, p < 0.001) and on the eighth (F (118) = 26.0, p < 0.001). The post-hoc test on the effect of "Group" demonstrated that the intensity range of the seventh syllable (rhythm scheme syllable) was significantly higher than that of the sixth syllable on the first sentence ( $\beta$ (Seventh syllable – sixth syllable) = 8.74, t (118) = 8.58, p <0.001), on the second sentence  $\beta$  (seventh syllable – sixth syllable) = 10.3, t (118) = 8.28, p < 0.001), on the fourth sentence ( $\beta$  (seventh syllable – sixth syllable) = 9.22, t (118) = 8.00, p < 0.001, on the sixth syllable ( $\beta$  (seventh syllable – sixth syllable) = 5.89, t (118) = 4.92, p < 0.001), on the eighth line $\beta$  (seventh syllable – sixth syllable) = 6.90, t (118) = 5.10, p < 0.001). This finding suggests that Chinese native speakers employed intensity range to realize the rhythm scheme.

"Fig. 4" shows the intensity range of the rhythm scheme syllable, the last syllable before it (S2) and the last but two before it (S1) for two types of rhythm scheme, cross rhythm and couplet respectively, in the Shakespearean sonnet. The intensity range was analyzed by a one-way analysis of variance with one factor, "Group" (rhythm scheme syllable and S2), in the cross-rhythm lines (12 lines) and couplet lines (2 lines). A significant effect of "Group" was found in the cross-rhythm lines (F (1109) = 16.2, p < 0.001) and in the couplet lines ((F (1104) = 16.9, p < 0.001). The Tukey posthoc test revealed that the intensity range of the rhythm scheme syllable was higher than that of S2 (the last syllable before it) in the cross-rhythm lines ( $\beta$  (rhythm scheme syllable -S2) = 2.80, t (1671) = 5.72, p < 0.001) and in the couplet lines ( $\beta$  (rhythm scheme syllable – S2) = 3.04, t (1671) = 5.98, p < 0.001), indicating that American native speakers adopted the prosodic cues of intensity range to realize rhythm scheme (cross rhythm and couplet).



Fig. 2. Pitch of unstressed syllables (second, fourth, sixth, eighth and tenth) and stressed syllables (first, third, fifth, seventh and ninth syllable) of each line in Shakespearean Sonnet as realized by American native speakers. Asterisks indicate statistical significance:  $p < 0.05^*$ ,  $p < 0.01^{**}$  and  $p < 0.001^{***}$ .



Fig. 3. Intensity range of rhythm scheme syllable (seventh syllable), sixth syllable and fifth syllable of the first, second, fourth, sixth and eighth line in heptasyllabic poetry from Chinese native speakers. Asterisks indicate statistical significance:  $p < 0.05^*$ ,  $p < 0.01^{**}$  and  $p < 0.001^{***}$ .



Fig. 4. Intensity range of rhythm scheme syllable, S2 (the last syllable before it) and S1 (the last but two before it) for rhythm scheme of cross rhythm and couplet in Shakespearean sonnets as realized by American native speakers. Asterisks indicate statistical significance:  $p < 0.05^*$ ,  $p < 0.01^{**}$  and  $p < 0.001^{***}$ .

#### IV. DISCUSSIONS

In light of the theory of the Poetic Function and the Genrespecific Hypothesis, the present study explored the prosodic patterns of Chinese and English poem reading, as well as similarities and differences between them.

The results showed that Chinese native speakers applied longer duration on the fourth and seventh syllable to each line in heptasyllabic poetry, suggesting that Chinese native speakers adopted prosodic patterns of duration to realize semantic rhythm (4+3). There are two potential possibilities for this realization of semantic rhythm from the aspects of phonology and semantics. First of all, this type of semantic rhythm caused by phonology can be easily found. Mandarin is a syllable-timed language [22] with one syllable for one tone [23]. More specifically, there are level tones (symbolized by "---") and oblique tones (symbolized by " | "). In Chinese Tang poetry and level tones take up the longest time in pronouncing [27]. In the current study, ten heptasyllabic poems beginning with oblique tones ( | ) and ending with level tones (---) were selected and the typical tone patterns in all lines were "| | - - | | - ". Therefore, level tones appeared on the fourth syllable and seventh syllable, resulting in longer duration on these two syllables. Secondly, semantic four-plus-three rhythm also lies in semantic separation. Cai [2] affirmed that one line in heptasyllabic poetry can be split into two parts according to semantic meaning. The anterior part for four syllables is an integrated part for statement while the posterior part for three syllables is for supplement, causing the longer duration on the fourth syllable. The longer duration on the seventh syllable possibly resulted from the effectiveness of rhythm pattern. Participants may produce the rhythm pattern not only through intensity range (mentioned as follows), but also through duration, because the rhythm scheme appears on the seventh syllable (last word in five of eight lines, increasing the possibility of longer duration on the seventh syllable. However, whether the way of realizing the rhythm scheme was through duration is still an open question. Further studies are needed to explore this issue.

The current data also demonstrated that American native speakers employed a larger pitch pattern on the stressed syllables than that of unstressed syllables, indicating that they adopted mean f0 (pitch) to realize meter (iambic pentameter in Shakespearean sonnets. The reason for this type of meter realization lies in English phonology. English is a stress-timed language [6]; thus, all words have at least one stressed syllable due to prosody arrangement of polysyllabic words, compounds of two monosyllabic words and phrases of two monosyllabic words. In English there is an interplay of weak and strong syllables. According to [20], in poetry creation or poetry reading, the position of selected words in Shakespearean sonnets usually follows the "WSWSWSWSWS" pattern. The current research versified this pattern in terms of mean pitch and showed that vowels appearing in stressed syllables in each verse line have a distinctly higher pitch than those of unstressed syllables, indicating that weak and strong patterns in English poetry could be influenced by pitch, while the rhythm in English poetry reading follows the XX/XX/XX/XX/XX pattern in the segment of stressed and unstressed vowels.

The results of intensity range of the rhythm scheme syllables suggested that both Chinese native speakers and English native speakers applied intensity range to realize the rhythm scheme in Chinese Tang poetry and Shakespearean sonnets respectively. For Chinese Tang poetry, our findings were different from Li's study [19], which concluded that the rhythm scheme for Chinese native speakers was produced by means of intensity. However, the validity of this experiment seems to be limited, since it involved only one participant. The reason for this realization could be attributed to physical factors. Generally, readers always present lower and lower intensity ranges in the process of reading sentences or discourses due to physical limitations [26]. However, when readers reach the seventh syllable (the place of the rhythm scheme), they are motivated and refreshed by the occurrence rhythming place and concentrate themselves on of pronouncing the rhythms; hence, the intensity range starts to increase again. Therefore, the current study proved that Chinese native speakers applied intensity range on rhythm patterns to highlight the rhythm scheme. The realization of the rhythm scheme in Chinese and English poetry reading shares the identical realization for the rhythm scheme. The perception of linguistic stress patterns for rhythm scheme can be responsible for the realization of rhythmical patterns. At least one vowel occurred in the formation of rhythm patterns for cross rhythm and couplet in Shakespearean sonnets, which carries stress on the tenth syllable. [10] investigated certain acoustic cues on the perception of linguistic stress patterns and found that intensity was one of the cues for judgements of stress. That is to say, in order to give prominence to the rhythm scheme of poems, American native speakers adopted acoustic cues of intensity range to increase the perception of linguistic stress patterns. Consequently, intensity range of stressed syllables has become the major way of realizing rhythm scheme in English poetry reading.

Our results also have implications for poetry reading teaching. Duration, pitch and intensity range and other prosodic aspects could be dealt with more in depth while teaching classical poetry such as Chinese Tang poetry and Shakespearean sonnets, so as to develop learners' aesthetic perceptiveness, imagination and motivation to read poetry.

# V. CONCLUSIONS

The present study revealed that both Chinese and English native speakers adopted intensity range to realize the rhythm pattern. However, other properties (semantic rhythm and meter) were produced using other acoustic cues (duration and pitch). Chinese native speakers applied duration to realize semantic rhythm while English native speakers employed pitch to realize meter (iambic pentameter). Our results also have implications for teaching of poetry reading, enabling learners to have further and profounder interpretation and appreciation of Chinese and English poetry.

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