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The Role of Chinese EFL Learners' Sensitivity to English Lexical Stress Patterns in Grammatical Category Assignments

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Abstract

This study investigated whether Chinese English as a foreign language (EFL) learners, in the absence of ostensive instruction, were sensitive to English suprasegmental patterns (i.e., stress) and exploited the patterns to solve the problem of grammatical category assignment in lexical learning. 60 sixth graders and 40 college students participated in a multi-trial English noun-verb stress alternation task, in which the alternation of stress between nouns and verbs was exemplified in carrier sentences over four learning trials in two conditions. In the consistent condition, the stress pattern of nouns and verbs matched English and was consistent across the exemplars. In the independent condition, there was no predictable relationship between stress pattern and grammatical categories. Results showed that Chinese EFL college students extracted the alternation pattern from the experimental input and assigned a pseudoword to a noun or a verb accordingly; sixth graders demonstrated some emerging sensitivity to the correlation between stress pattern and grammatical categories, but their sensitivity was not robust in all analyses. Neither college students nor sixth graders generalized their stress sensitivity to new pseudowords. The findings suggest that exploiting suprasegmental cues to grammatical assignment in English is a slow and protracted process among Chinese EFL learners and can hardly be mastered in the absence of direct and explicit instruction.

Key words: suprasegmentals, sensitivity to English prosody, English prosodic cues, English noun-verb stress alternations

INTRODUCTION

Being able to extract phonological regularities from input, either first language (L1) or second language (L2), allows a learner to start acquiring the lexicon and the syntax of the language (e.g., Speciale, Ellis, & Bywater, 2004; Storkel, 2001, 2003). In addition to regularities at the segmental level such as phonotactics and distributional constraints, evidence has emerged showing that sensitivity to suprasegmental features, or prosodic features of the language, also plays an important role in language acquisition (Fisher, Plante, Vance, Gerken, & Glattke, 2007; Lindfield, Wingfield, & Goodglass, 1999; Speer, Crowder, & Thomas, 1993; Valian & Levitt, 1996; Weinert, 1992; Whalley & Hansen, 2006). For example, several studies have found that prelinguistic English-acquiring infants presented with strings of continuous speech are sensitive to the trochaic stress pattern of English and can use this sensitivity to locate word boundaries or phrasal units during the second half of the first year (Johnson & Jusczyk, 2001; Jusczyk, Houston, & Newsome, 1999; Seidl, 2007; Soderstrom, Seidl, Nelson, & Jusczyk, 2003). It has been proposed that prosody is among the first several cues that children use in acquiring L1 (Gerken, 1996; Jusczyk, 1999).

Suprasegmental cues that are informative and distinctive vary considerably like segmental cues across languages and may not be perceived or interpreted in the same way by speakers of different languages. For example, the most distinctive suprasegmental cue in Mandarin Chinese is tone whereas it is stress in English. A change in tone involves rhythmic rise and fall of pitch and results in a lexical change in Mandarin Chinese. A similar change in English is not

perceived distinctive unless it is coupled with changes in length and loudness (Katamba, 1989). How English suprasegmental cues are exploited by Chinese learners of English in support of lexical learning is less well understood. The present study used a noun-verb stress alteration task to examine whether Chinese learners of English exploit the suprasegmental properties of English lexical stress to aid in initial word learning when the suprasegmental regularities are available in the input.

LITERATURE REVIEW

The role of lexical stress in the process of English has been examined in a variety of studies. Though motivated by different research questions, these studies generally found that lexical stress plays an important role in the comprehension of English. For example, Lindfield et al. (1999) found that word prosody (word stress) was part of listeners' memory representation and was used by listeners in spoken word recognition. Speer et al. (1993) investigating the importance of prosody in sentence recognition also found that suprasegmental structures in a sentence was an integral part of the memory representation and that prosody was maintained in memory even when the sentences were nonsense. In addition to spoken word recognition and sentence recognition, prosody is also found important in the processing of written language. For example, recognition of visually presented target words was facilitated by stress-matching spoken primes (Cooper, Cutler, & Wales, 2002). Whalley and Hansen (2006) further suggested that suprasegmental sensitivity might

contribute not only to word identification skills, but also to reading comprehension. Lack of sensitivity to prosodic or suprasegmental features has been proposed to be one of the factors that cause difficulties in language learning (Weinert, 1992), as dyslexic children and children with specific language impairment are less sensitive to prosodic features (Fisher et al., 2007; Surányi, Csépe, Richardson, Thomson, Honbolygó, & Goswami, 2009; Weinert, 1992).

One problem associated with lack of sensitivity to prosodic cues is difficulty in exploiting prosodic cues for grammatical assignment. In English, several prosodic cues such as number of syllables and stress pattern are correlated with grammatical categories (Kelly, 1992). For example, English content words tend to contain more syllables than function words (Cultler, 1993; Shi, Werker, & Morgan, 1999); nouns are likely to consist of more syllables than verbs (Cassidy & Kelly, 1991, 2001). Another prosodic/suprasegmental property that can serve as a cue to grammatical categories is stress pattern. In English, certain nouns and their corresponding verbs, nearly identical in segmental composition, differ in their stress patterns: nouns in trochaic stress (strong-weak stress pattern like *REcord*), and verbs in iambic stress (weak-strong stress pattern like *reCORD*). According to a statistical analysis of 3,000 disyllabic nouns and 1,000 disyllabic verbs (Kelly & Bock, 1988), 90% of the trochaic words are nouns and 85% of the iambic words are verbs, indicating the correlation between lexical stress distribution and grammatical category in English is a general phenomenon rather than specific to homographs like *record*.

Empirical evidence has shown that English speakers are sensitive to the correlation between stress pattern and grammatical category and exploit the correlation in language processing. For

example, English speakers classify real words with typical stress patterns (e.g., the trochaic noun *basket* or the iambic verb *revolve*) into their grammatical category more quickly and accurately than words with stress patterns atypical of their grammatical category such as the iambic noun *hotel* or the trochaic verb *rotate* (Arciuli & Cupples, 2003; Davis & Kelly, 1997). Similarly, native English speakers are more likely to pronounce a disyllabic pseudoword (e.g., *proveen*) embedded in a noun position of a carrier sentence with a trochaic stress pattern and the one embedded in a verb position with an iambic stress pattern (Kelly & Bock, 1988). They are also more likely to use iambic nouns as verbs than trochaic ones when asked to use the nouns to create a sentence (Kelly, 1988). In addition, there is evidence that English-speaking preschool children prefer to map pseudowords to actions when the pseudowords contain one syllable rather than three syllables and this knowledge of the noun/verb syllable number difference is applied to a novel word learning task (Cassidy & Kelly, 2001). Taken together, these findings suggest that native English speakers are sensitive to the fact that variations in stress may determine the grammatical categories of words and that they can apply this rule to new words (Kelly, 1988).

The question is whether Mandarin-Chinese learners of English as a foreign language (EFL) also attend to relevant prosodic cues and exploit the cues to solve problems in lexical learning. Mandarin Chinese is known as a tone language, using level tone, rising tone, falling-rising tone, and falling tone to distinguish lexical meanings. Tone, one aspect of prosody, is defined in terms of the rhythmic rise and fall of pitch (Leong, Cheng, & Tan, 2005). In Mandarin Chinese, the meaning of a syllable is completely different when the tone is

changed. For example, the syllable "da" with the falling tone means "big," whereas the one with the falling-rising tone means "hit." In contrast to tone, to which pitch is the primary acoustic cue for perception, acoustic cues to the perception of stress include not only pitch but also length and loudness (Katamba, 1989). One consequence of de-stressing a syllable is the change of vowel quality. Unstressed syllables, normally with lower pitches, shorter duration, and less intensity, often contain reduced vowels such as schwa [ə] while stressed syllables normally contain full, nonreduced vowels.

Although research has shown that sensitivity to prosodic features is important in learning English and Chinese, whether such sensitivity can be transferred from one language to another remains open. Most of the studies on cross-language transfer at the suprasegmental level found that L1 prosodic information affects the way L2 prosodic cues are perceived, especially when the second language is typologically different from the learner's L1 (Archibald, 1997; Dupoux, Sebastian-Galles, Navarrete, & Peperkamp, 2008; Lehiste & Fox, 1992; Nguyen & Macken, 2008; Pennington & Ellis, 2000; Tremblay, 2008; Wayland, Guion, & Landfair, 2006; Yu & Andruski, 2010). However, in a study of sensitivity to stress alternation between nouns and verbs by native and nonnative speakers, Davis and Kelly (1997) found that both native and non-native subjects used iambic pseudowords as verbs in making sentences more often than trochaic pseudowords, indicating that nonnative speakers can identify lexical stress patterns of English. Similar findings were obtained in a study of spoken word recognition in which typically stressed trochaic nouns and iambic verbs exhibited advantaged processing, as compared with atypically stressed iambic nouns and

trochaic verbs (Arciuli & Cupples, 2004). However, aside from Chinese EFL learners, these studies involved non-native speakers from different L1 backgrounds, including Spanish and Italian, in which L1 stress is also contrastive and lexical like English. It is not clear whether learners from a typologically different L1 such as Chinese are also sensitive to stress alternation of English as the Spanish and Italian subjects in the study.

Recognizing that sensitivity to prosodic features is important in learning English, the present study sought to explore whether Chinese EFL learners were sensitive to the contrasting stress pattern of English noun-verb opposition and used this special pattern as a prosodic cue to infer the grammatical categories of new words. In English, stress is important when learners identify English noun-verb oppositions like *REcord* and *reCORD*. However, stress involving changes in length and loudness is not distinctive in Mandarin Chinese, where the distinctive prosodic cue is the rhythmic pitch contour of tone. Given that prosodic cues to stress are not distinctive in Mandarin Chinese, it is predicted that beginning learners of English would have difficulty fully capitalizing on the prosodic regularities available in the input to support grammatical assignment in lexical learning. In addition to prosodic cues, this study also included two measures of learner characteristics. One was tone awareness, which allowed us to examine whether Chinese EFL learners' tone awareness correlates with their sensitivity to English stress patterns. Although prosodic cues to stress and tone are different, it is still possible that sensitivity to L1 prosodic information reflects a general, language-independent capacity to extracting prosodic regularities from the input and thus is a potentially important predictor of L2

prosodic sensitivity. The other was English vocabulary knowledge. It is unclear how English vocabulary knowledge is related to L2 lexical learning. On one hand, participants with richer vocabulary knowledge may be more sensitive to the prosodic distributions of English and thus more able to use prosodic cues to solve problems in lexical learning. On the other hand, a lack of vocabulary knowledge may increase reliance on phonological cues to grammatical category (Davis & Kelly, 1997).

METHOD

Participants

Two age groups of Chinese EFL learners, 60 sixth graders and 40 college students, participated in the present study. Sixth graders, recruited from three classes in a public primary school in Taipei, were included because they had some basic knowledge of the English carrier sentences used in the present study after at least three years of English learning. Participation was based on teacher and parental consent and student assent. The college students ranged from freshmen to seniors of different majors in a university in Taipei. They represented learners at the more terminal end of EFL learning. Each participant was tested individually in a quiet room of the participant's school. Two measures of learner characteristics were given before an English noun-verb stress alternation task.

Measures of Learner Characteristics

English Vocabulary. The Peabody Picture Vocabulary Test-IV

(PPVT-IV) (Dunn & Dunn, 2007) was used to measure the English vocabulary size that the Chinese EFL learners had developed prior to the participation of the present study. PPVT-IV consists of a series of 228 plates of four colored pictures, organized into 19 sets of 12 items in ascending order of difficulty. For each plate, the test giver provided a stimulus word orally. Each participant was asked to choose the picture that best represented the meaning of the stimulus word. Test administration proceeds until an error criterion is reached (eight or more errors in a set). The Internal consistency (Alpha) reported in the test manual ranges from .92 to .98.

Tone Awareness. Tone awareness was assessed by a tone matching test. The participant listened to a stimulus syllable (e.g., *gei* in the falling tone) and then another two syllables, one in the same tone as the first syllable (e.g., *gou* in the falling tone) and the other in a different tone (e.g., *gan* in the falling-rising tone). The participant had to choose from the two Chinese syllables the one that had the same tone as the first syllable. There were 20 triads of syllables. In half of the triads, the stimulus syllable and the two choices in a triad had the same onset (e.g., *gei*, *gou*, and *gan*). In the other half, the stimulus syllable and the two choices had the same rime (*gei*, *hei*, and *fei*). The maximum score for each participant was 20.

English Noun-Verb Stress Alternation Task

The task began with warm-up trials to make sure that the participants understood the task procedure. The stress alternation part of the task proceeded in an exposure-and-test format across four trials. Each trial consisted of an exposure phase and a test phase. Following the four trials of learning was a generalization test.

Materials. The stimuli were eight pseudowords (*conzee, feslak, roncerp, beldop, ponsect, convact, merest,* and *formand*) selected from a study conducted by Kelly (1988). Eight animated clips were created and randomly paired with the eight pseudowords. Each clip depicted a strange object performing or experiencing a strange action, for example a single-eye monster with many elastic legs simultaneously shooting out and shrinking back to normal size (Figure 1).

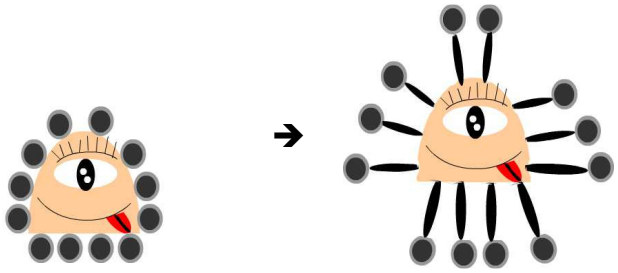

Figure 1
An Example of the Animated Clips

The design of the task was adapted from an experimental paradigm developed by Cassidy and Kelly (2001), which examined whether native English-speaking children used syllable numbers as a prosodic cue in support of new word learning. There were two learning conditions in the present study: consistent and independent. In the consistent condition, the eight pseudowords were modeled with the stress pattern consistent with the contrasting pattern of English noun-verb opposition such as *CONzee* (noun) vs. *conZEE* (verb). In

the independent condition, no apparent rules governed the stress pattern of the pseudowords. The participants in each age group were randomly assigned to one of the two conditions. They had to learn the meaning of the pseudoword per clip depending on the condition.

Warm-up Trials. There were two warm-up trials, in which video clips of two familiar actions (sleeping and singing) and two familiar animals (a dog and a cat) were used to familiarize the participants with the exposure-and-test format of the task. In the exposure phase, the participant watched four animated clips one by one. Each clip depicted one of the familiar animals (dog or cat) performing one of the familiar actions (sleeping or singing). Each of the clips was described by two English sentences, one introducing the noun ('This is a _____' or 'I like the _____') and the other the verb ('It _____s' or 'It is _____ing'). After the four clips were presented and described to the participant, the test phase began with the participant watching the four clips one by one again in a different order. For each clip, the participant was read two sentences and he or she had to choose the one that better described the clip. For example, after seeing the clip of a dog's singing, the participant was asked, "Which sentence is correct, this is a dog, or this is a sing?" Both the noun *dog* and the verb *sing* matched the scene in the clip but only one appeared in the appropriate sentential position. The warm-up trials prepared the participant for the subsequent noun-verb stress alternation task, which required selection of a sentence that had the pseudoword in the appropriate sentential position.

Exposure Phase. In the exposure phase, the participant was told that he or she would learn new English words in sentences and the learning of the new words would be tested subsequently. Then the test

giver showed the participant the first animated clip that depicted the first pseudoword. The test giver modeled the pseudoword with contrasting stresses in the carrier sentences, using *ponsect* as an example: This is a *PONsect.* It is *ponSECTing*. In the consistent condition, the eight pseudowords were presented in a way that the one in the noun position (i.e., 'This is a _____') was in trochaic stress and the one in the verb position (i.e., 'It is _____ing') was in iambic stress. In the independent condition, half of the eight pseudowords were presented in an opposite way, that is, nouns with an iambic stress and verbs with a trochaic stress. Thus, in the independent condition, stress pattern did not predict grammatical categories of the pseduowords.

Test Phase. After exposure to the eight pseuowords exemplified as nouns or verbs, the participant was tested on his or her learning of the eight pseudowords with a sentence selection format. To make sure that the participant did not perform the task by rote memorization, the pseudowords were tested in two new carrier sentences (i.e., 'I like the _____'/ 'It _____s'), in addition to the carrier sentences used in the exposure phase (i.e., 'This is a _____'/ 'It is _____ing'). The participant was shown an animated clip, accompanied by two sentences. The participant had to choose the one that better described the scene on the clip. For example, the test giver pointed to the animated clip and said, "Which sentence is correct? I like the *ponSECT,* or I like the *PONsect*?" This tested whether the participant used the stress patterns that were experimentally imposed in the two learning conditions to assign grammatical categories (Max = 8 pseudowords × 4 trials = 32).

Generalization Test. To understand whether the participants generalized what they had learned to new pseudowords, a

generalization test was given at the completion of the fourth learning trial. There were eight untrained, new disyllabic pseudowords paired with eight new animated clips. The participant was shown an animated clip and was required to listen to two sentences with pseudowords that contrasted in stress placement (e.g., 'I like the *preVELL*' and 'I like the *PREvell*' or 'It is *merSETting*' and 'It is *MERsetting*'). The participant had to indicate which sentence sounded more like a real English sentence for each clip.

RESULTS

Table 1 presents the descriptive statistics of the learner characteristics and the experimental measures. The participants' performances on the generalization task were put into two categories: conventional and non-conventional, the former representing the frequencies of grammatical assignment following the conventional English stress pattern and the latter representing the frequencies of grammatical assignment that was different from the conventional English stress pattern. As shown in Table 1, the college students outperformed the sixth graders in the measures of learner characteristics, that is, English vocabulary ($t(98) = 9.41$, $p < .01$) and tone awareness ($t(98) = 3.42$, $p < .01$). They also scored higher in the practice trial ($t(98) = 3.51$, $p < .01$). Moreover, their overall performance on the English stress alternation task was higher than the sixth graders' ($t(98) = 2.16$, $p < .05$). The two groups of sixth graders, who were assigned to the consistent condition or the independent condition, did not differ significantly on either of the two learner

characteristics ($t(58) = 1.93$, $p > .05$ for PPVT; $t(58) = 1.04$, $p > .05$ for tone awareness). Similarly, the two groups of college students did not differ significantly on either of the two learner characteristics ($t(38) = .12$, $p > .05$ for PPVT; $t(38) = 1.17$, $p > .05$ for tone awareness).

Table 1
Chinese EFL Learners' Performance on Measures of Learner Characteristics and the Experimental Task

	Sixth graders				College students			
	Consistent		Independent		Consistent		Independent	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Learner Characteristics								
English Vocabulary (228)	42.40	19.73	32.10	21.65	81.75	29.34	82.80	24.11
Tone Awareness (20)	14.87	2.61	14.10	3.10	16.65	2.08	15.90	1.97
English Stress alternation								
Practice Trial (4)	3.13	.97	2.8	1.21	3.65	.59	3.65	.75
Trial 1 (8)	4.60	1.50	3.97	1.56	5.05	1.36	4.25	1.71
Trial 2 (8)	5.00	1.70	4.67	1.56	5.85	1.50	4.40	1.76
Trial 3 (8)	4.60	1.71	4.07	1.46	5.60	1.85	4.35	1.84
Trial 4 (8)	4.47	1.41	4.07	1.70	5.05	2.31	4.45	1.79
Overall (32)	18.67	4.08	16.77	3.46	21.55	4.41	17.45	3.14
Generalization								
Conventional (8)	4.53	1.50	4.20	1.19	5.10	1.77	3.95	1.36
Nonconventional (8)	3.47	1.50	3.80	1.19	2.90	1.77	4.05	1.36

Note. The numbers in parentheses are maximum scores.

English Noun-Verb Stress Alternation

To examine whether the Chinese EFL learners capitalized on the noun-verb stress pattern to support lexical learning, two sets of repeated-measures analyses of variance (ANOVAs) were carried out,

separately for the sixth graders and the college students. The scores obtained from the noun-verb stress alternation task were submitted to 2 x 4 ANOVAs, with Learning Condition (consistent vs. independent) as the between-subjects variable and Trial (1, 2, 3, and 4) as the within-subjects variable. The results of the ANOVA on the sixth graders revealed a nonsignificant interaction between Learning Condition and Trial ($F(3, 174) = .27$, $p > .05$). In addition, there was neither the effect of Learning Condition ($F(1, 58) = 3.78$, $p > .05$) nor the effect of Trial ($F(3, 174) = 2.06$, $p > .05$). Similarly for the college students, there was no interaction effect between Learning Condition and Trial ($F(3, 114) = .51$, $p > .05$) or effect of Trial ($F(3, 114) = .61$, $p > .05$). However, there was an effect of Learning Condition ($F(1, 38) = 11.49$, $p < .05$), indicating that the college students in the consistent condition attended to the stress pattern empirically imposed in the pseudowords for grammatical assignment. Figure 2 displays the participants' performance on the English noun-verb stress alternation task across the four trials.

To further understand whether the Chinese EFL learners were sensitive to the English noun-verb stress alternation, one-sample *t* tests were conducted to examine whether the mean total score in each group was above the chance level (8*4 trials/2 = 16). The results of the one-sample *t* tests showed that both the sixth graders and the college students in the consistent condition performed significantly higher than the chance level ($t(29) = 3.58$, $p < .05$ for sixth graders; $t(19) = 5.63$, $p < .05$ for college students), but those in the independent condition did not ($t(29) = 1.21$, $p > .05$ for the sixth graders; $t(19) = 2.07$, $p = .054$ for the college students).

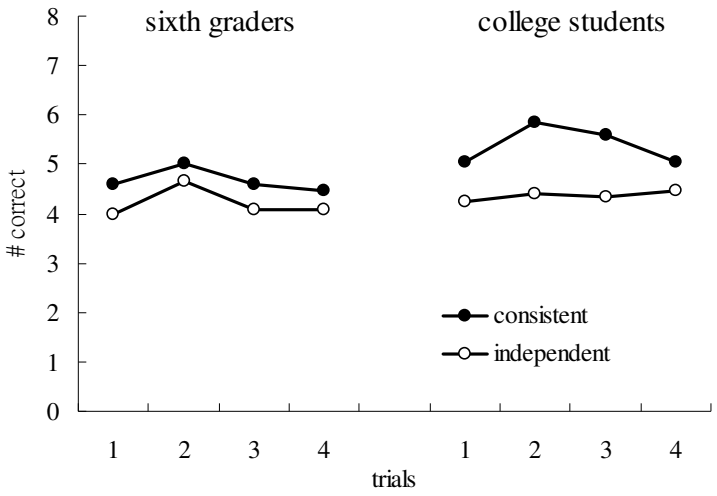

Figure 2
Performance of English Noun-Verb Stress Alternation Across the Four Trials

To understand whether the participants generalized what they had learned in the exposure phase to new exemplars, the participants' generalization performances were classified into two categories: conventional and non-conventional. Assigning trochaic pseudowords to nouns and iambic pseudowords to verbs was considered to be conventional, while assigning trochaic pseuodowords to verbs and iambic ones to nouns was considered nonconventional. The results of the *chi square* test showed that for the sixth graders, there were no significant differences in the distribution of frequencies across the categories between the consistent condition and the independent condition ($\chi^2(1, N = 60) = .43, p > .05$). Similarly, the difference in

the distribution of frequencies across the categories between the two conditions was not significant for the college students ($\chi^2(1, N = 40) = 2.6$, $p > .05$), indicating that the college students in the consistent condition did not take advantage of the English noun-verb stress alternations exemplified in the exposure phase in assigning new pseudowords to their grammatical categories.

Learner Characteristics

Correlational analyses were conducted to examine the role of tone awareness and English vocabulary for the participants' performance in using stress for grammatical assignment. The results showed that for both the sixth graders and the college students, there was no significant correlation between overall performance in English noun-verb stress alternation and tone awareness (all *p*s > .05). Similarly, none of the correlations between the participants' overall performance in English noun-verb stress alternation and English vocabulary were significant (all *p*s > .05).

DISCUSSION

Sensitivity to Stress Alternation

Earlier work has shown that native English adults and native English children as early as preschoolers exploit prosodic cues to grammatical categories in support of lexical learning (Cassidy & Kelly, 2001; Davis & Kelly, 1997; Kelly, 1988). Although non-native English learners have been found sensitive to the English noun-verb stress differences (Davis & Kelly, 1997), it is unclear whether they

exploit prosodic cues in support of lexical learning. The results of the present study suggest that prosodic cues to stress are used to some extent by Chinese EFL learners. The college students who were exposed to the typical English stress pattern performed better in assigning the pseudowords to their appropriate sentential positions than those who were exposed to a condition in which the stress pattern did not provide information about the grammatical categories. Although the sixth graders exposed to the English stress pattern did not outperform their counterparts who were exposed to the stress pattern without exact rules, a secondary analysis of their performance against the chance level revealed that the sixth graders who were exposed to the typical English stress patterns of noun-verb oppositions demonstrated better performance than simply guessing, whereas those in the independent condition did not exceed the chance level. These findings suggest that the Chinese EFL children might have developed some emerging sensitivity to English noun-verb stress alternations prior to or during the experimental task, but their sensitivity was not strong enough for them to outperform the children who learned a similar set of pseudowords in the independent condition.

It may be premature to conclude that Chinese EFL learners would learn to use English prosodic cues in support of lexical learning naturally if the regularities of prosodic cues were made available in the input. In the present study, the sensitivity of the Chinese EFL learners, both adults and children, did not increase across the learning trials. This finding is different from that in earlier work on prosodic cues of syllable number (Cassidy & Kelly, 2001). In Cassidy and Kelly's study, native English preschoolers demonstrated

increasing sensitivity to the correlation between English prosodic cues of syllable number and grammatical categories over multiple exposures. The present study, though with a focus on prosodic cues of stress pattern rather than on syllable number, did not find that the Chinese EFL learners' sensitivity progressed with an increasing amount of exposure during the experimental task. Recall that in the present study, each participant was given eight examples of stress alternation between nouns and verbs. Across the four learning trials, each participant was exposed to a total of 32 tokens of noun-verb alternation. Neither the sixth graders nor the college students showed growth in their ability to process stress in support of lexical learning over the learning trials. It thus appears that the development of sensitivity to English noun-verb stress alternations is a slow and protracted process among Chinese EFL learners, even if they had years of exposure to the English language.

The results of the generalization test further confirmed the slow development of using prosodic cues in support of lexical learning among Chinese EFL learners. There was no evidence that the Chinese EFL children took advantage of the typical English stress pattern to assign grammatical categories for the untaught pseudowords in the generalization test. This situation held true for the college students, who demonstrated robust sensitivity to English noun-verb stress alternation in the learning trials. Thus, it seemed that the Chinese EFL learners were able to grasp some stress pattern in pseudowords if the pseudowords were exemplified in a contrastive stress pattern. However, this grasp did not seem to be tenable in pseudowords in which the noun-verb opposition was not exemplified but had to be inferred.

One may argue that the participants' lack of sensitivity to English noun-verb stress alternation in support of new word learning has something to do with their insufficient knowledge of the carrier sentences used in the present study. However, this did not seem to be the case. In the present study, the Chinese EFL learners, both children and adults, demonstrated high accuracy on the warm-up trials (74% for the sixth graders; 91% for the college students). They were able to select between a noun (e.g., dog) and a verb (e.g., sing) to complete carrier sentences (e.g., 'This is a dog' or 'This is a sing'), which depicted scenes in which both the noun and the verb were applicable (e.g., A dog is singing). The high accuracy in the warm-up trials indicated that the participants had the requisite knowledge of the carrier sentences, at least to the extent of whether a word denoting an object (e.g., dog) or a word denoting an action (e.g., sing) was appropriate in a certain sentential position (e.g., 'This is a_____').

Why did the Chinese EFL learners fail to generalize what they had learned to new pseudowords? One possibility might be that the participants stored the specific stress pattern that co-occurred with the nouns and the verbs lexically without understanding the general pattern governing the noun-verb alternation, thereby allowing for little systemwide generalization to new exemplars. Even though in some cases the participants were tested with their understanding of the pseduowords in new carrier sentences, it was still possible that they processed, for example, the pseudoword *CONzee* as a noun and *conZEE* as a verb without attending to their stress contrast. Storing *CONzee* and *conZEE* as two separate lexical items would allow the participants to assign the pseudowords to their appropriate sentential position even in a new carrier sentence, but would not allow for

generalization to new pseudowords. However, the possibility can be ruled out because it cannot explain why the college students performed better in the consistent condition than in the independent condition or why the sixth graders in the consistent condition performed above the chance level whereas those in the independent condition did not.

Another possibility that might explain why the participants failed to generalize what they had learned to new pseudowords could have something to do with the challenging nature of the prosodic abstraction process. In the generalization test, the EFL learners had to discern the stress pattern from the pseudoword pair and assign the appropriate pseudoword to the sentence frame in one exposure to the pseudoword pair. The contrastive pseudowords differed not only in prosodic features but also in vowel quality. For example, the first vowel is [ɑ] in *CONzee* but [ə] in *conZEE*. Given that Chinese EFL learners do not rely on vowel quality to identify stress placement (Yu & Andruski, 2010), it is possible that the participants in the present study might have treated the contrastive pseduowords as two different phonological sequences, contrasting in segmental composition. In addition, the participants were exposed to each contrastive pseudoword pair only once, which might have been challenging in establishing specified phonological representations for grammatical assignment. In fact, it has been shown that frequency affects accuracy of stress production (Jarmulowicz, Taran, & Hay, 2008). As the participants heard the pseduoword pair only once in the generalization test, the representations of the sounds and syllable structures of the pseudowords might be fragile and not robust enough for the extraction of the stress pattern in support of grammatical assignment.

It is certainly not easy to explain the absence of a significant generalization effect with the design of the present study. Further study may increase the input frequency of the pseudoword pairs in the generalization test to examine whether generalization occurs when the pseudoword pairs reach a certain level of frequency. Nevertheless, the poor performance the participants showed in the generalization test further supports the notion that for Chinese EFL learners, using prosodic cues in support of lexical learning is a gradual and protracted process, which may require exposure to the contrastive pattern over multiple exemplars as well as exposure to an exemplar over multiple episodes of learning.

Learner Characteristics

The present study examined two learner characteristics, tone awareness and English vocabulary, which were considered relevant to the development of sensitivity to English prosodic cues. Although tone and stress are both suprasegmental cues, there was no significant correlation between the Chinese EFL learners' tone awareness and their use of prosodic cues for English noun-verb assignment. A possible explanation is that appeared that one might not be sensitive to prosodic features that are not found or not prominent in their native languages. In Chinese, tone differences result in meaning differences in the syllable, whereas the stress opposition examined in the present study is related more to grammatical differences than meaning differences. The pseudowords with contrastive stress pattern described the same scene but were put in different sentential positions, some as nouns (e.g., This is a *CONzee*) and some as verbs (e.g., It is *conZEE*ing). The non-significant correlation between tone awareness

and stress sensitivity might be partly attributable to the functional differences between tone and stress. To further understand the role of tone awareness in the development of stress sensitivity, future studies may include a task in which the change of stress results in changes in meaning rather than in grammatical categories.

There was no evidence that another learner characteristic, that is, English vocabulary size, was related to the use of prosodic cues to English noun-verb stress alternations among the Chinese EFL learners, as evidenced by the results of the correlational analysis. In addition, if vocabulary size is related to the use of prosodic cues in support of lexical learning, participants who have a larger vocabulary should have a better chance in developing insight into the English stress alternation between nouns and verbs. However, the college participants, who had a larger English vocabulary size than the sixth-grade participants, did not show an increase in sensitivity to the connection between stress pattern and grammatical categories over the learning trials. These findings suggest that larger vocabulary size may not directly affect the development of sensitivity to English noun-verb stress alternations among Chinese EFL learners.

CONCLUSION

Word learning is more than committing a specific word form to memory. It involves fine-tuning a process that allows extraction of useful information for systemwide learning. The results of the current study provide some preliminary understanding about the use of English prosodic cues to grammatical categories in support of lexical

learning among Chinese EFL learners. In the present study, the Chinese EFL learners demonstrated some sensitivity to the correlation between English stress patterns and grammatical category assignments. However, this emerging, empirically-induced sensitivity did not increase over the learning trials in the experimental task and did not generalize to new instances of pseudowords, suggesting that the development of sensitivity to English noun-verb stress alternations might be a slow and protracted process among Chinese EFL learners. The present study also reveals that Chinese EFL learners' sensitivity to English noun-verb stress alternations is not correlated with their Chinese tone awareness or English vocabulary size. Although the present study failed to identify learner characteristics that were associated with using prosodic cues in support of lexical learning, it provides an important step in understanding the development of prosodic sensitivity. We cannot simply assume that prosodic sensitivity developed from L1 is used to advantage in lexical learning of another language or that the ability to exploit prosodic cues in lexical learning unfolds with language development in another language. These findings altogether lead to the implication that Chinese EFL learners, from children to adults, can be made sensitive to English prosody, but that a gap exists in internalizing and fully utilizing the emerging sensitivity to the noun-verb stress alternation to bolster new word learning. With sufficient time, multiple exposures, and ostensive instruction, Chinese EFL learners' sensitivity to English prosody may become stronger and more accessible to support their word learning. However, this possibility awaits future research which extends the span of learning or supplies direct instruction on the stress alternation rule between nouns and verbs.

There is at least one limitation in the present study. Although earlier studies have found that Chinese adult learners are able to identify and discriminate stress patterns in real words, pseudowords, and hums out of sentence context (Yu & Andruski, 2010), the present study did not measure whether the Chinese EFL learners had the perceptual ability to discriminate stress pattern of the pseudowords in the sentential context. Without this information, it is unclear whether the participants regarded contrastive pseudowords as a form with different stress patterns or as two distinctive forms with different segmental compositions. Future studies should be carried out to investigate whether Chinese EFL learners can discriminate the stress placement of English disyllabic or multisyllabic words before the administration of the noun-verb stress alternation task.

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英語學習者運用重音轉換於詞類分派上的研究

摘要

本研究探討臺灣英語學習者是否能不透過直接教學，意識到英語語料中名、動相對詞超音段音位（重音）的轉換，進而運用超音段音位上的轉換將英語詞彙分派到適當的句法位置。六十名臺灣六年級學童和四十名臺灣大學生參與一項英語名動重音轉換學習作業。這項學習作業以假字為語料，包含四次學習及四次檢驗，假字置於不同的英語承載句中，提供辨別假字詞性的線索。半數的受試者學習到的假字重音轉換與英語名動詞性的轉換相關；半數的受試者學習到的假字，其重音轉換與詞性轉換無關。研究結果發現當語料的重音變化與詞性相關時，臺灣大學生能運用名、動相對詞的重音轉換來決定假字的詞性。六年級學童只有在某些分析中顯現英語名、動相對詞重音敏感度。然而，不論是大學生或是六年級學童，都無法將所學之名、動相對詞之重音規則應用於新詞的學習。上述結果顯示，在沒有直接或明確的指導下，運用語料中的超音段音位（重音）做為新詞學習的線索，對臺灣英語學習者而言，是一項緩慢發展的歷程。

關鍵詞：超音段音位　英語韻律敏感度　英語韻律訊息　英語名/動相對詞重音變化