Phonological Awareness in English Meets Phonological Awareness in Chinese

英语语音意识与汉语语音意识的碰撞与交流

胡敏 著

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前　言

语音意识是个体将较大音韵单元分割成较小单元并处理这些单元的能力。语音意识是多层级的技能。其中，英语语音意识包括音节意识、首音－韵脚意识和音位意识；汉语语音意识（以普通话为主）则包括以上三个层级的语音意识以及声调意识。语音意识技能对母语和二语的阅读、拼写和听力等语言技能至关重要，因此知晓语音意识和语音意识研究可以帮助二语教师在教学中引入语音意识培训，以提高学生的二语语音意识，以期最终提高其二语能力。本书通过比较英语语音意识和普通话语音意识，旨在为语音意识研究者提供理论借鉴，并为英语或汉语二语教师提供教学参考。

首先是进行语言内比较，对英语母语者和中国英语学习者的英语语音意识进行比较，对汉语母语者和汉语二语学习者的普通话语音意识进行比较。然后是进行语言间比较，对英语语音意识和普通话语音意识进行比较。此比较主要围绕三个方面的文献展开：1）不同层级或种类语音意识的发展；2）促进语音意识发展或表现的因素；3）语音意识能力在语言能力中的作用。该比较探索了英语语音意识和普通话语音意识都遵循的普遍模式以及每种语言特有的语音意识模式，旨在回答四个问题：1）英语语音意识和普通话语音意识的发展有何异同；2）语言经验对英语语音意识和普通话语音意识的影响有何异同；3）英语语音意识和普通话语音意识如何跨语言相互影响；4）英语语音意识和普通话语音意识在语言内或语言间对阅读技能的预测作用有何异同。

Contents

Chapter 1 Introduction

Phonological awareness (PA) is a mental ability to decode and manipulate internal segments of words (Bentin, Hammer, & Cahan, 1991; Jones & Munhall, 2002; Liberman, Shankweiler, Fisher, & Carter, 1974; Morais, Alegria, & Content, 1987; Morais, Cary, Alegria, & Bertelson, 1979; Wagner & Torgesen, 1987). PA emphasizes the sounds of language rather than the meaning of language. In other words, it requires listeners to analyze and manipulate segmental units of speech instead of the meaning of the speech (Sodoro, Allinder, & Rankin-Erickson, 2002). Referencing Stuart-Smith and Martin (1999), PA refers to "the ability to store, access, retrieve, and manipulate phonological representations" (p. 56).

Beginning with native speakers of English, PA research has explored speakers of other alphabetic languages or Chinese, a logographic language. PA research mainly examines three levels of PA: syllable awareness, onset and rhyme awareness, and phoneme awareness, based on the hierarchical view of the syllable structure proposed by Treiman and his collgues (Bruck, Treiman, & Caravolas, 1995; Treiman, 1985, 1986; Treiman & Zukowski, 1996). According to this trichotomy, the syllable is composed of three levels of segments: the largest syllable, the intermediate onset and rhyme, and the smallest phoneme. This hierarchical structure has been confirmed by Treiman's research (1985, 1986, 1995) on speech errors, short-term memory errors, word games, and the perception of phonological units.

PA research covers a wide range of issues, but one focus of this book is on Chinese learners of English, children or adults, and the relationships between their PA in English and English skills. Three relevant empirical attentions will be discussed in this book: 1) how PA in English should be assessed; 2) how PA in English is affected by some factors; and how PA in English affects English skills. To investigate the three issues will help us 1) examine Chinese learners' English PA and discover the deficiency

in their PA skills; 2) uncover factors that could promote or prelude the development of their PA in English; and 3) find out the way in which English PA enhances specific English skills. These three enquiries will benefit English teachers in that they will learn to examine the strengths and problems in their students' English PA, analyze the factors contributing to those problems and come up with proper solutions, and finally improve their students' English proficiency by improving their English PA in the first place.

The other focus of this book is on PA in Chinese languages (Chinese is used in the following for a simpler term). This line of research is of particular interest because of the unique logographic orthography of Chinese. Such studies are important in that they can help determine whether PA in Chinese develops in the same way predicted by current linguistic theories concerning English PA. It may be that the relative importance of PA depends on how different languages and orthographies are learned. Experimental work has been done to examine the development of Chinese speakers' PA in Chinese. Most of the research has addressed one Chinese language—Mandarin, the only official language in China, and has yielded findings similar to those in previous research with English speakers that the alphabetic knowledge (*Pinyin*), spoken languages (dialects), and L2 learning experience (e. g., English) have a facilitating effect on PA in Mandarin. More research is needed to investigate all three levels of PA in Mandarin. Such research can address the call by Liberman et al. (1974) and Treiman (1985, 1986) for additional research on this topic.

By reviewing major studies on PA in both English and Chinese, this book aims to provide an insight into the universal patterns both English PA and Chinese PA share as well as features specific to PA in each language. It also has pedagogical significance because it is indispensable to either English or Chinese second or foreign language learning. The supreme status of English learning in modern China is self-evident. On the other hand, the recent development of Chinese economy has made other nations realize the urgency of including foreign Mandarin instruction in school curricula. Both Mandarin second and foreign language learners need to develop good PA in Mandarin (especially tone awareness) in order to speak Mandarin in an understandable way. The literature review this book provides will suggest ways to address areas of weakness and build on areas of strength for teaching either English or Mandarin to nonnative speakers.

This book is outlined as follows. Chapter 2 reviews relevant research on PA in alphabetic languages (primarily PA in English of English speakers). It begins with the linguistic status hypothesis, the launching pad for the research on the development of

PA. What follows is the introduction of different levels of PA and discussion of their different developmental patterns relative to reading instruction. Next, focus is placed on the relationships between phoneme awareness and reading and reading-related skills. This chapter ends with an analysis of the role of spoken language and bilingual experience in the development of PA. Chapter 3 presents a review of pertaining research on PA in English of Chinese English learners in three aspects. First, how to assess their English PA in a reliable and valid way is discussed; next, what factors promote or preclude PA development or performance is analyzed; and finally, what role PA in English or Chinese plays in English skills is examined.

Focusing on PA in Chinese (primarily Mandarin) of both Chinese native speakers and Chinese learners, Chapter 4 starts with an introduction of phonological characteristics of Mandarin. Then, it provides a description of studies on the development of PA in Mandarin, factors affecting such development, and the relationship between PA in Mandarin and Chinese skills. Due to the special nature of Mandarin tones, this chapter ends with a review of studies on factors contributing to tone awareness. Chapter 5 reports the cross-language research on both Chinese speakers' English PA and their Mandarin PA in pursuit of a better understanding of the features universal to PA in both languages and specific to each. Based on research questions these studies are meant to ask, the results are discussed and compared with the literature of relevant studies. This chapter ends with the implications the review of research on both English PA and Mandarin PA has for future PA research and teaching on a microscopic level and for teaching English or Mandarin as L2 on a macroscopic level.

Chapter 2 Phonological Awareness in Alphabetic Languages (Primarily English)

PA is recognized to have different types based on the phonological units instead of being one overall skill (Trainman & Murkowski, 1996, p. 67). Syllable awareness is the awareness of the syllabic segments of a word. For example, the English word *dog* has one syllable, *sister* has two (sis-ter), and *happiness* has three (hap-pi-ness). Phoneme awareness is the awareness of phonemic segments. For example, the English word *graph* has four sounds /g-r-æ-f/, and *cat* has three sounds /k-æ-t/. In addition to the two types of PA is onset/rhyme awareness, the awareness of intrasyllabic segments between syllables and phonemes. For example, the word *graph* can be divided into two parts, /gr-æf/, with /gr/ as the onset and /æf/ as the rhyme. Therefore, the assessment of PA is not based on one type of task that fits all situations, but includes assorted tasks depending on the speech segments tested. PA tasks test various abilities to manipulate phonological units, e. g., abilities to count syllables or phonemes; to determine whether two items share a syllable or rhyme; to pinpoint the item which differs from others in a specific phonological unit; and to segment an item, delete a phoneme, or blend several phonemes into a new word, etc.

Sufficient empirical attention has been given to the awareness of different phonological units. The implicit assumption is the linguistic status hypothesis proposed by Rebecca Treiman and her colleagues (e. g., Bruck et al., 1995; Treiman, 1985, 1986; Treiman & Zukowski, 1996). The following goes into details about this hypothesis and evidence presented from previous studies.

The linguistic status hypothesis

An important role of the syllable in the analysis of PA has been recognized by all

major approaches to phonology including the early Prague School, London Prosodicists, American Structuralists, and Generative Phonology (Blevins, 1995). However, the internal structure of a syllable has not been agreed upon. The linear view (Clements & Keyser, 1983) proposes that consonants and vowels are the smallest components of a syllable with no internal structure above them. For example, the English syllable *graph* /græf/ is regarded to be a string of /g/ - /r/ - /æ/ - /f/. This argument, according to Treiman (1983), is basically phonological that onsets and rhymes have no important role in describing the sound structure of different languages.

An alternative hierarchical view states that the syllable is a string of subunits, which are smaller than the syllable and larger than the phoneme (Blevins, 1995; Fudge, 1969, 1989; Selkirk, 1982; Treirnan, 1985, 1995; Treiman & Zukowski, 1991). The most influential hierarchical view is the linguistic status hypothesis (Treiman & Zukowski, 1991) that an intermediate level of structure called onset and rhyme exists between the syllable and the phoneme. The onset is optional and comprises the consonant (s) preceding the vowel, and the rhyme is obligatory and includes the vowel nucleus and an optional coda or any following consonant (s). Therefore, at the top of the structure is the syllable, which is composed of intrasyllabic units of onset and rhyme, which are in turn composed of individual phonemes (see Figure 1).

***Figure* 1. Hierarchical view of the syllable (Treiman & Zukowski, 1991, p. 69).**

The syllable's superiority is evidenced by the study of Bruck et al. (1995) which administered a speeded non-word comparison task to English-speaking undergraduates. Participants heard a pair of spoken stimuli on each trial and then quickly decided whether the two stimuli shared the beginning, middle, or end sound in these three conditions. The stimuli for each condition consisted of 40 pairs of two-or three-syllable non-words. Half of the *yes* pairs shared a complete syllable. In the beginning condition, the shared syllable was the first syllable in the two-syllable non-words (e. g., /ˈ*kip*kæst/ - /ˈ*kip*bɔːld); in the end condition, the shared syllable was the second syllable in the two-syllable non-words (e. g., /pɔːˈ*mair*/ - /inˈ*mair*/; in the middle condition, the

shared syllable was the second of three syllables (e. g. , /dɚˈ*gis*ro/ - /liˈ*gis*fa/). The other half of the *yes* pairs shared part of a syllable. The shared unit was the onset and vowel of the first syllable in the beginning condition (/ˈ*fli*gmil/ - /ˈ*fli*kboz/), the rhyme of the final syllable in the end condition (/koˈbɚʃ/ - /inˈtɚʃ/, or the rhyme of the middle syllable in the middle condition (/daiˈg*æ*l*p*vu/ - /niˈf*æ*l*p*kɚ/). The results revealed that participants provided more correct responses when the shared unit was a complete syllable compared with when it was only part of a syllable. Bruck et al. interpreted this result as demonstrating that syllable is at the top of the structure in perception of phonological units.

However, the superiority of syllables over onsets/rhymes and phonemes could be attributed to the unit size hypothesis (Brady, Fowler, & Gipstein, 2000; Walley, Smith, & Jusczyk, 1986) that syllables are larger units and thus easier to decode. To examine this possibility, Treiman & Zukowiski (1996) tested preschoolers and kindergarteners using different kinds of unit in the same size. Children were told that a puppet liked words which shared some sounds and that when he heard two words like this, he was happy. The child repeated a pair of stimulus words uttered by the experimenter and then indicated whether the puppet liked them. In one experiment, half of the *yes* pairs shared a syllable (e. g. , retreat-entreat); the other half shared part of a syllable (e. g. , oppressed-undressed).

However, no significant differences were observed between the two types of pairs. The finding was attributed to the use of real words as stimuli, so another experiment used non-words. Half of the *yes* pairs shared a whole syllable (e. g. , /fpˈkir/ - /næˈkir/); the other half shared a final rhyme (part of a syllable) (e. g. , /toˈbmp/ - /fæˈsmp/. The difference between these two types was found to be small (7%) but statistically reliable. The small gap was attributable to the design of the task that the shared part was at the end of a word so that children probably misunderstood the task as a rhyming task, thus ignoring any shared units larger than rhymes. In another experiment, as a result, the shared unit was in the middle of a trisyllabic non-word. Half of the *yes* pairs shared a middle syllable (e. g. , /vəˈgænli/ - /suˈgænmo/); the other half shared the rhyme but not the onset of the middle syllable (e. g. , /moˈvarnli/ - /duˈzarnbə/). The results showed significantly better performance on the whole syllable than on the rhyme, but could be attributable to the fact that the shared rhyme in the pairs was followed by more consonants. The number of consonants following the rhyme was equated in the last experiment, e. g. , /spiˈ*vu*kə/ - /teˈ*vu*gro/ for the pairs sharing a syllable and /

de'k*of*not /- / si'p*of*wəg / for the pairs sharing a rhyme. The superiority of the syllable over the rhyme was observed as well. Taken together, these experiments pointed to the linguistic status hypothesis in rejection of the unit size hypothesis.

There is linguistic evidence for the onset / rhyme division in a syllable (Treiman, 1983, 1984). Whereas co-occurrence can happen between any onset and rhyme, co-occurrence between codas and vowels is highly constrained. That is, onsets and rhymes are independent units. For example, a short vowel can co-occur with a tri-consonantal coda (as in *simple*), but a long vowel cannot (*seemple* is a non-word in English). In this sense, vowels and codas can combine to form a higher level of unit—rhyme. Moreover, rules of stress assignment in English apply only to the rhyme rather than to the onset. There is also a massive body of behavioral evidence for subsyllabic units of onset / rhyme coming from research on speech errors (Fromkin, 1970; Mackay, 1970, 1972), word games (Treiman, 1983, 1985, 1986), short-term memory errors (Treiman, 1995; Treiman & Danis, 1988), and the perception of phonological units (Barton, Miller, & Macken, 1980; Treiman, 1980; Treiman, Salasoo, Slowiaczek, & Pisoni, 1982; Treiman & Zukowiski, 1991, 1996) by both children and adults who were native speakers of English.

Speech errors

Speech errors demonstrate the onset / rhyme structure. Mackay (1970, 1972) examined two types of errors: spoonerisms and blends of words with similar meanings. Spoonerisms are exchange of some phonemes in different words in the serial order of speech. For example, the sentence "You've missed my history lectures" is misspoken as "You've hissed my mystery lectures." Mackay noted that the errors usually involved the exchange of consonant clusters with consonant clusters or with a single consonant, just like those in Fromkin (1970) such as *sweater drying* misuttered as *dreater swying* and *throat cutting* as *coat thrutting*. The second type of error appeared to show the same pattern. When two words with similar meanings were blended, the initial consonant (s) of one word tended to be combined with the vowel and following consonant (s) of the other word. For example, *flavor* and *taste* were blended into produce *flaste* more often than *faste*; *start* and *go* were blended to *sto* more frequently than *so*. Mackay concluded that analysis of errors in spontaneous speech and blending demonstrated that initial consonant clusters (onsets) and rhymes behave as units in speech production.

Word games

Treiman(1985) employed language games to examine the effects of syllable structure on children's phonemic analysis. Experiment 1 supported the hierarchical view of syllable by demonstrating that 8-year-old children averaged fewer errors on word games that treated onsets and rhymes as units than games that did not. Within either condition of the experiment—the CVC(e. g. , /fɛ̲g/) condition and the CCV(e. g. , /fru/) condition, the child learned two games to transform each three-phoneme stimulus and then give a response syllable for each game: Game A replacing the first and second phonemes of the stimulus and Game B replacing the second and third phonemes. In the CVC condition, Game A replaced the initial CV of each stimulus with /lʌ/(e. g. , /fɛ̲g/ -- /*l*ʌg/); Game B substituted /ʌl/ for the final VC(rhyme)(e. g. , /fɛ̲g/ -- /fʌ*l*/). In the CCV condition, Game A replaced the CC(onset) of each stimulus with /sl/(e. g. , /fru/ -- /*sl*u/), and Game B replaced the CV with /li/(e. g. , /fru/ --/f*li*/). Game B in the CVC condition treated the rhyme(VC) as a unit, and Game A in the CCV condition treated the onset(CC) as a unit. The results showed that the two games that required segmenting the syllable into onsets and rhymes posed less difficulty for children.

Additional evidence for the onset unit came from Experiments 2 and 3, which asked 4-and 5-year olds to recognize an initial consonant in spoken non-words and printed real words respectively. There were three types of stimuli—a CV syllable, a CVC syllable, and a CCV syllable. The initial consonant in the CVs and CVCs was an onset while in CCVs it was a phoneme, part of an onset CC. In Experiment 2, the child was shown a puppet and was told the puppet's favorite sound; then the child was asked to judge whether the sound was in a stimulus or not. In a picture-letter matching task in Experiment 3, the child saw a series of pictures and judged whether the name of each picture began with a target letter. The results from these two experiments revealed that children more easily recognized syllable-initial consonants when they were the onset than when they were part of consonant clusters(i. e. part of onsets).

The effects were also found with adults in Treiman(1983) which used two experiments focusing on onsets and rhymes respectively to examine preference for a specific solution in a word game. Before each experiment, adult native speakers of English learned two rules, A and B, to play a word game. During the experiment, they first listened to a word and then were supposed to transform this word by using either rule A or rule B. In the first experiment involving CCVC non-words(e. g. , /skef/), /æz/ would be added

after the CC or onset, so /skef/ would be changed to two syllables /skæz/ and /*ef*/ if rule A was used. Using rule B, /æz/ would be added after the initial phoneme, so /skef/ became /*sæz*/ and /kef/. In the second experiment involving CVC non-words (e. g. , /fug/), using rule A, participates would insert two sounds, e. g. , /o/ and /d/, between C and VC to form /*fo*/ and /*d*ug/. Using rule B, they would insert the sounds between CV and C to form /fu*d*/ and /*og*/. The two experiments yielded consistent findings that participants preferred rule A that treated a syllable as a hierarchical structure composed of onsets and rhymes over rule B that referred to a single phoneme.

Another two experiments investigated which rule, A or B, was more difficult to learn for a specific unit (onset or rhyme). Participants were directed to do a word game using both rules. In the first experiment using CCVC non-words, by rule A, /æz/ and /p/ were added after the CC, so /slos/ became /slæz/ and /pos/. By rule B, /æz/ and /p/ were added after the initial C, so /slos/ became /*sæz*/ and /*p*los/. In the second experiment using CVC non-words (e. g. , /yoz/), by rule A, two sounds /ɛ̲g/ and /s/ were inserted between C and VC, so /yoz/ became /y*ɛg*/ and /*s*oz/. By rule B, two sounds /g/ and /sɛ̲/ were inserted between the CV and C, so /yoz/ became /yog/ and /sɛ̲z/. The results showed that participants averaged significantly more errors when using rule B that did not refer to the natural division between the onset and rhyme than rule A that did, indicating that rule B was more difficult to learn than rule A. Taken together, the results suggested that a hierarchical syllable structure was involved in playing a word game.

Treiman (1986) provides further evidence for the onset/rhyme division. She conducted seven experiments to extend previous results to real words in Experiments 1 and 2, to different types of phonemes in Experiments 3 and 4, to three-phoneme onsets in Experiments 5 and 6, and to adults in Experiment 7. All participants were English-speaking college students. In Experiments 1 and 2, they were asked to do a blending task. Participants heard two words (both CVCCs in Experiment 1 and CCVCs in Experiment 2) on each trial. They combined them into one new word by taking part of the first word, starting from the beginning, followed by part of the second word. For example, there were three possible responses for the CVCC pair /pæ̲kt/ *packed* and /nʌts/ *nuts*: /pʌts/ (C/VCC), /pæ̲ts/ (CV/CC), and /pæ̲ks/ (CVC/C). For the CCVC pair /frel/ *frail* and /slæ̲t/ *slat*, the three possible responses were /flæ̲t/ (C/CVC), /fræ̲t/ (CC/VC), and /fret/ (CCV/C). The results indicated that for both CVCCs and CCVCs, participants appeared to prefer onset/rhyme blends—C/VCC in Experiment 1

and CC/VC in Experiment 2. In Experiment 3, participants were asked to divide a CCV stimulus(e. g. , /spo/) in two different ways(/s/ - /po/ or /sp/ - /o/) and then to give two response syllables. The first response syllable consisted of the first divided part followed by a fixed CV sequence /ɛ͡ʃ/. The second response consisted of the second part followed by a fixed phoneme /b/. For example, the results would be /sɛ͡ʃ/ and /po*b*/ for the C/CV division and /spɛ͡ʃ/ and /o*b*/ for the CC/V (onset / rhyme) division. Experiment 4 used a procedure like that of Experiments 1 and 2 with a new type of syllable—CVC. For example, participants were asked to blend a pair /pab/ and /gæ͡f/ in different ways. Two possible responses were /pæ͡f/ (C/VC) and /paf/ (CV/C). The results from Experiments 3 and 4 showed a clear preference for onset / rhyme blends regardless of the type of prevocalic consonant.

The same results held for Experiment 5 which required the transformation of each CCCV stimulus into two response syllables according to three divisions—C/CCV, CC/CV, and CCC/V(onset / rhyme). As in Experiment 3, the first response was composed of the first divided part followed by /ɛ͡ʃ/; the second response comprised the second part followed by /b/. For example, the two responses for the syllable /skwa/ were /sɛ͡ʃ/ and /kwa*b*/ for the C/CCV division, /skɛ͡ʃ/ and /wa*b*/ for CC/CV, and /skrɛ͡ʃ/ and /a*b*/ for CCC/V. Experiment 6 required the participants to hear a pair of nonsense CCCV words and to make a new word by blending one part of each word. For example, possible responses for the pair /spli/ and /skrɔ/ were /splɔ/ (CCC/V), /sprɔ/ (CC/CV), or /spɔ/ (CC/V). Participants generally joined the entire clusters (onset) of the first word with the rhyme of the second word. In Experiment 7, college students learned word games that required them to divide each three-phoneme stimulus and give a response syllable for each game as the 8-year olds did in Treiman (1985). The adults' performance was superior to that of children, but they tended to perform better on games that treated onsets and rhymes as units as did children.

Treiman, Fowler, Gross, Berch, and Weatherston (1995) extended word games to disyllabic and trisyllabic words. The stimuli were nonsense trisyllables with the structure /$C_1VC_2VC_3C_4V$/. The first syllable /C_1V/ was always /ʃə/, and the last two phonemes of the third syllable was always /əð͡/. In the one-phoneme substitution condition, the C_2 rule changed the first consonant of the middle syllable to /g/ (e. g. , /ʃə'*p*olhə ð͡/ -- /ʃə'*g*olhəð͡/). The C_3 rule changed the last consonant of the middle syllable to /g/ (e. g. , /ʃə'po*l*həð͡/ -- /ʃə'po*g*həð͡/). In the two-phoneme substitution condition, the C_2V rule changed the first consonant and the vowel of the middle syllable to

/ g ɛ̲ / (e. g. , / ʃə'*po*lhəð̲ / -- / ʃə'*g*ɛ̲lhəð̲ / . The VC_3 rule changed the vowel and the last phoneme of the middle syllable to / ɛ̲g / (e. g. , / ʃə'p*ol*həð̲ / -- / ʃə'pɛ̲*g*həð̲ /). English-speaking college students were assigned randomly to the two conditions by half. They learned the two rules for their condition and were required to transform the orally presented stimuli using the two rules. The results showed that participants performed significantly better when using the C_2 rule which referred to the onset unit and the VC_3 rule which referred to the rhyme unit than when using the C_3 rule which referred to part of the rhyme and the C_2V rule which did not refer to any unit.

In another experiment, the stimuli were disyllabic non-words with the structure / $C_1VC_2C_3VC_4$ /. In the first-syllable stress condition, the CV rule changed the first consonant and the vowel of the first syllable to / gɛ̲ / (e. g. , / ʧæ̲pf_1b / -- / gɛ̲pf_1b / . The VC rule replaced the vowel and the final consonant of the first syllable with / ɛ̲g / (e. g. , / ʧ æ̲pf_1b / -- / ʧɛ̲gf_1b /). The second-syllable condition had the same two rules which changed the phonemes in the second syllable. For example, / ʧæ̲pf_1b / was changed to / ʧ æ̲pg ɛ̲b / according to the CV rule and to / ʧæ̲pfɛ̲g / according to the VC rule. Consistent with the first experiment, participants averaged significantly fewer errors when using the VC rule involving the rhyme than when using the CV rule involving a vowel and its preceding consonant. This study demonstrates the onset / rhyme division in disyllables and trisyllables.

Short-memory errors

The effect of the syllable structure comes from the research on short-term memory as well. In the Treiman and Danis (1988) study with English-speaking adults, Experiment 1 required participants to listen to six recorded CVC syllables twice on each trial. At the first time, they repeated each syllable after hearing it. At the second time, they heard all syllables and were asked to repeat them in the same order. It was observed that most of the errors were made by recombining some phonemes from the stimulus list. When one phoneme of a stimulus was retained in an error, it was usually the initial consonant or onset. When two phonemes were kept, these were usually the vowel and the following consonant or rhyme. The error of combining the onset of one stimulus and the rhyme of another occurred most frequently. Experiment 2 tested CCV syllables. When an error retained one phoneme of a stimulus, it was most often the vowel or rhyme. When an error retained two phonemes, they tended to be the first two consonants or the onset. Taken together, the results suggested that participants analyzed the syllable based on onset