The effect of blocking on learning of Chinese characters

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ABSTRACT

Previous research has shown that the learning of second language words in the simultaneous presence of pictures or first language equivalents interferes with their acquisition. The purpose of this study was to examine whether learning Chinese characters in the simultaneous presence of their pinyin spellings (Romanised alphabet i.e., representations of pronunciation) interferes with the pronunciation and meaning acquisition of the characters. Four presentation techniques were formed by the combinations of pinyin presence versus pinyin absence, and feedback versus simultaneous presentation. That is, character-pinyin-English equivalent, character-English equivalent; character (delay) pinyin-English equivalent; character (delay) English equivalent. The results showed that the two feedback presentations were superior to the two simultaneous presentations. That is, recall of the meanings of the characters was superior under the feedback procedures when compared with the simultaneous techniques. In the case of
pronunciation, a similar advantage was observed for the feedback procedures. The comparisons which examined the effect of pinyin showed that it was neutral in the case of the acquisition of meaning, but that it assisted in the acquisition of correct pronunciation. It was concluded that feedback procedures can be used to neutralise the effect of blocking during simultaneous presentation, and that pinyin is an aid to acquiring correct pronunciation of Chinese characters.

Many techniques for teaching Chinese characters have been proposed but the most popular and conventional way to introduce a new character to the learner is to present a new character together with its pinyin and first language equivalent. Pinyin spelling is a Romanised alphabet which literally means to form sounds into spellings. For example, the Chinese character " " is paired with its pinyin "shu" and English equivalent "book". It is generally assumed that, when a new Chinese character is introduced to beginning learners, the presence of pinyin and first language equivalent will facilitate character learning. It is thought that the use of pinyin can effectively promote the learning of Chinese (Mingyuan, Zhu & Ji, 1983; Jordan, 1971) for a number of reasons: Firstly, once a pinyin system is mastered, it helps pronunciation in that even though Chinese characters generally contain a phonetic component, this component is not a systematic guide to pronunciation. Pinyin helps learners to pronounce new characters easily and correctly (Huang & Hanley, 1995). Secondly, its acquisition enables the learners to participate in written communication quickly, without necessitating a knowledge of Chinese characters (Jordan, 1971). Finally, with the help of pinyin, learners can read a large quantity of reading materials in parallel with character and pinyin as to correct pronunciation, enlarge their vocabulary and improve their spoken language (Dai & Lu, 1985). In the same line, it is commonly assumed that a picture or first language word provides cue to help identify the character and helps learners to comprehend the meaning of the character more quickly. This instructional method, therefore, has become the most popular and conventional approach.

The practice of pairing a character with its pinyin and first language equivalent together has been accepted as a convention, and yet the efficacy of this approach is seldom questioned and examined. Reference to the research literature on the effect of a picture prompt on sight word learning and the effect of presenting a first language word during second language vocabulary instruction, suggests that the presentation of pinyin and first language equivalent to assist the learning of Chinese character may not be the best approach. Previous findings have consistently suggested that teaching children to name a picture and then reinforcing the name of the picture inhibits the learning of written word (e.g., Wu & Solman, 1993; Solman & Wu, 1995). Also, related investigations into the teaching of second language vocabulary have showed that the presentation of the first language word during learning depresses the rate at which the second language word is learnt.
Solman and his colleagues (e.g., Solman & Adepoju, 1995; Solman & Chung, 1996; Wu & Solman, 1993) argue that the negative effect of presenting previously learnt, first language words with to-be-learned second language words (or pictures with to-be-learned words) is an example of blocking. Blocking refers to an event in which prior conditioning to one element prevents conditioning to other elements of a compound (Kamin, 1969; Kehoe, 1987). That is, if one stimulus of the simultaneous stimuli has been part of training preceding the use of both stimuli, the trained stimulus will retain all of the associative value while the new stimulus will fail to gain its associative strength (Kehoe, 1987; Rescorla & Wagner, 1972). The picture-word or first-second language word problem is analogous to the phenomenon of blocking. Blocking occurs when a previously learned cue (picture/first language word) presented with a new element (sight word/second language word), makes the latter redundant by initiating the correct response. Learning is inhibited under these conditions, as it takes some considerable effort to transfer the response from the blocking element to the to-be-learned word.

Most beginning learners of Chinese learn pinyin before they undertake the task of learning characters. Pinyin and English equivalent are usually presented, alongside with its corresponding character, during learning. This is the precondition for blocking, and this approach is inhibiting the rate at which the Chinese character is learnt. That is, when a character, pinyin and English equivalent are presented together, the presence of pinyin and English equivalent are likely to trigger their pronunciation and meaning response automatically. The association between the pinyin and its pronunciation is established. Similarly, the association between the English equivalent and its meaning response is formed. As a consequence, it is very difficult to establish the new association between the character and its response in terms of pronunciation and meaning. This view seems to discredit the idea that the pairing of a character with its pinyin and English equivalent together provides character learning.

While previous studies (Solman & Adepoju, 1995; Solman & Chung, 1996; Wu & Solman, 1993) have showed that the feedback presentation can be used to neutralise the adverse effect of pictures and first language equivalents in learning new words, it is possible that this approach can also eliminate the blocking effect of the pinyin and English equivalent in learning the character. In the feedback presentation, a character is presented first, then learners are asked to think about its pronunciation and meaning responses. They are told whether their answer was correct or incorrect either visually or aurally after an interval of 5 seconds. This method allows the character to gain the associative strength more quickly, because it prevents the familiar English equivalent and pinyin from immediately evoking the meaning and pronunciation responses. In this case, by using the pinyin and English equivalent in the feedback, the precondition for the pinyin and English
equivalent to gain associative strength from the character may be reduced. Instead, they will act as the way of reinforcing correct responses and stimulation of some mental effort towards eliciting appropriate responses (Solman & Adepoju, 1995; Wu & Solman, 1993). Hence, using the feedback procedure may enhance the character learning. The main purpose of this study was to examine whether learning characters in the presence of their pinyin would interfere with the pronunciation and meaning acquisition of the characters. It might be expected that the pinyin and English equivalents in the feedback would neutralise the negative effect of blocking. The second purpose of this experiment was to explore whether the presence of pinyin would improve the learning of characters.

METHOD

Subjects

Twelve year eight students were selected randomly from a Christian college in Sydney, Australia. A child was not selected if he 1) could not speak and read English, 2) had obvious learning disabilities, behavioural or emotional problems, 3) could recognise any of the Chinese stimulus characters in the pre-test trials, and 4) was not familiar with the pinyin system. Twelve male students took part in this experiment. Their mean age was 13.2 years.

Stimulus materials

Sixteen concrete English nouns which were common in students' daily speech were selected with their Chinese equivalents. The English words had a direct translational equivalent in the characters. There were 16 cards for each pinyin, pictures, Chinese characters and their English equivalents, 16 compound cards which consisted of a character with its pinyin and English equivalent (i.e., xiangelephant), and 16 compound cards consisting of characters with their English equivalent (i.e., elephant) The single cards were printed in lower case with black marker pen on a 17cm x 12cm white flash card, while the standard compound cards were printed in lower case with black marker pen on a 32cm x 12cm white card, and the compound cards were written in lower case with black marker pen on a 32cm x 12cm white card. The picture cards were 15cm x 21cm. The cards used for pre-tests and post-tests were the same as those used during the learning sessions.

Design

The experiment was a repeated measurement design with four levels of independent variable. The four experimental conditions were: Standard Character Pinyin Meaning Condition (SPM), Standard Character Sound
Meaning Condition (SM); Feedback Character Pinyin Meaning Condition (FPM), Feedback Character Sound Meaning Condition (FM). The 16 Chinese characters with their pinyin and English equivalents were divided into four groups of characters.

a) b) c) d)

Twelve students were divided into four groups. Sixteen characters were assigned randomly into each group. The purpose of grouping these characters with the students was to counterbalance the presentation of characters and methods by using independently randomised 4 x 4 Latin squares. Also, it helped to reduce preparation time and errors during recombination of characters and conditions for different students. In addition, the order of presenting words was assigned randomly from session to session in order to avoid any potential order effect. Furthermore, the order of presenting treatment conditions was rotated in each session.

These four conditions were:

Standard Character Pinyin Meaning Condition (SPM)

The stimuli in this condition were 16 standard compound cards in which the characters were presented with and to the left of the pinyin and English equivalents simultaneously. The experimenter introduced this condition to the student by saying, "I am going to show you some cards." and "I want you to look at and listen to the characters carefully, because I have to see how many characters you can remember at the end of this lesson." Each of the standard compound cards was then displayed to the student one at a time. Upon viewing the standard compound cards, the experimenter pointed to the character and said "This character is pronounced as________." And asked the student to repeat it once. If the student pronounced the sound correctly, the experimenter reinforced it by saying "good" and asked the student to repeat it once. But, if the student gave no response to the character or pronounced the character incorrectly, the experimenter provided the correct response and then asked the student to repeat it twice. Further, the experimenter also pointed to the pinyin without pronouncing. After viewing the character and pinyin, the experimenter then pointed to the English equivalent and said "In English it means ________." The student was asked to repeat the English word once.

Standard Character Sound Meaning Condition (SM)

The stimuli in this condition were 16 compound cards in which characters with their English equivalents were presented simultaneously. The experimenter introduced this condition to the
student by saying, "I am going to show you some cards" and "I want you to look at and listen to the characters carefully, because I have to see how many characters you can remember at the end of this lesson." Each of the compound cards was then displayed to the student one at a time. The experimenter then pointed to the character and said, "This character is pronounced as________." And asked the student to repeat it once. The experimenter then also pointed to the character and repeated the pronunciation of the character again and asked the student to repeat it once. If the student pronounced the word correctly, the experimenter reinforced it by saying "good" and asked the student to repeat it once. But, if the student gave no response to the character or pronounced the character incorrectly, the experimenter provided the correct response and then asked the student to repeat it twice. Upon viewing the compound cards, the experimenter pointed to the English word and said "This English word is ________." And asked the student to repeat it once.

Feedback Character Pinyin Meaning Condition (FPM)

The stimuli in this condition were 16 single character cards and 16 compound cards in which the pinyin were presented to the left of the English equivalents. Each of the single cards of characters and their pairs was exposed to the student individually. The experimenter introduced this condition to the student by saying, "I am going to show you some cards." and "I want you to look at and listen to the characters carefully, because I have to see how many characters you can remember at the end of this lesson." The single character was presented first, and the experimenter pointed to it and said, "This character is pronounced as________and means________." The experimenter then said, "I want you to think about the pronunciation and meaning of this character." After an interval of 4 seconds, the experimenter then pointed to the character and said, "This character is pronounced as________." and asked the student to repeat it. If the student pronounced the character correctly, the experimenter reinforced it by saying "good" and asked the student to repeat it once. However, if the student gave no response to the character or pronounced the character incorrectly, the experimenter gave the correctly pronounced response and asked the student to repeat it twice. Viewing the character was followed by presentation of the compound card with the pinyin and its English equivalent. The experimenter showed the character card side by side with its equivalent pinyin and English card and pointed to the pinyin without giving any pronunciation of the character and then pointed to the English word and said, "In English it means ________." The student was asked to say it once.

Feedback Character Sound Meaning Condition (FM)

The stimuli in this condition were 16 single English and Chinese cards.
The experimenter introduced this condition to the student by saying, "I am going to show you some cards" and "I want you to look at and listen to the characters carefully, because I have to see how many characters you can remember at the end of this lesson." Each of the single cards of English and its pair was exposed to the student individually. The single character was presented first, and the experimenter pointed to it and said, "This character is pronounced as _______ and means ________." The experimenter then said, "I want you to think about the pronunciation and meaning of this character." After an interval of 4 seconds, the experimenter then pointed to the character and said, "This character is pronounced as ________." and asked the student to repeat it. The experimenter then also pointed to the character and repeated the pronunciation of the character again and asked the student to repeat it once. If the student pronounced the character correctly, the experimenter reinforced it by saying "good" and asked the student to repeat it once. However, if the student gave no response to the character or pronounced the character incorrectly, the experimenter gave the correctly pronounced response and asked the student to repeat it twice. The experimenter showed the English card side by side with its equivalent character card and pointed to it and said, "This English word is ________." The student was asked to say the English word once.

Procedure

The experiment consisted of the following phases:

Pre-test

During the pre-test phase, the students were tested individually and randomly with pictures and their English equivalents once and pinyin and characters twice. The pre-tests were given in order to ensure that the students already knew their pinyin and English words in terms of sounds and meanings. Also, the pretests were given to ensure that the students did not know any of characters in terms of sounds and meanings before the experimental treatments. In addition, the students were asked whether they had learned characters formally and informally. After establishing rapport, a set of picture card was given to match with the English equivalents. The experimenter also asked the students to read out the English words on the single card one at a time. The experimenter also encouraged the students to ask questions if he or she did not understand the meanings of their English words. If the student could not read the English words and understand their meanings, the experimenter told them the correct name and meaning and asked the students to repeat the name twice. The single English word and picture cards were re-shuffled until the students could read these words and understand their meanings. Then, the experimenter gave out the single character cards and said to the students, "Now, let's look at these
characters. I want to see whether you know how to pronounce any of these characters and their meanings. If you know them, tell me what they are, but if you do not know them, please say 'Pass'”. Each of the single character cards was presented to the students for about 5 seconds or removed immediately after a response. The experimenter made no comments on the students' response during this process. The single character cards were re-shuffled and presented for a second trial. After viewing the single character cards, the single pinyin card was displayed individually. The experimenter said to the students "Now, let's look at the pinyin. I want to see whether you know how to pronounce any of these pinyin. If you know them, tell me what they are, but if you do not know them, please say 'Pass'". Each of the single pinyin cards was presented to the students for about 5 seconds or removed immediately after a response. The experimenter also asked the students to read out the pinyin on the single card one at a time. If the student could not pronounce it correctly or gave no response, the experimenter told them the correct pronunciation and asked the students to repeat the pronunciation twice. The single pinyin cards were re-shuffled until the students could read these pinyin. Twelve students were selected from those who met the selection process as described above.

Learning and testing trials

In the learning phase, the students individually attended as many sessions as necessary to learn 16 characters, with each session lasting not more than 15 minutes. The students experienced all four experimental conditions and learned one group of characters under each experimental condition. Each character was displayed about 8 seconds for all experimental conditions during the learning session. At the end of each learning session, an immediate post-test on the 16 characters was followed. The experimenter told the students, "I am going to show you sixteen characters. I want to see how many of these characters you can remember. I want you to read out these characters and tell me what they mean in English. If you cannot remember its meaning or pronunciation, please say 'Pass'". Each character was presented for approximately 10 seconds for the students to respond, unless they indicated that they wanted to pass that character. No feedback regarding their responses was given, but they were informed of their progress each time.

The learning and immediate post-test phase terminated when the student had reached the criterion. Each student's correct response was recorded for each condition, according to the following criteria: (1) a student's correct responses for meanings and pronunciations were recorded for each condition. (2) a student had to reach the criterion of four correct meaning and pronunciation responses for all the four characters on three consecutive test trials in at least one of the treatment conditions before the learning phrase was terminated. The
student took part in the study for 2 or 3 days per week and for one session per day.

RESULTS

Each student's learning was measured in terms of the correct responses to the meaning and the pronunciation of the characters during the immediate post-tests for each of the four experimental conditions. The proportion of correct responses for the pronunciations and meanings recorded for each student was obtained by dividing a student's total number of correct responses by the total number of characters presented (i.e., number of test trials x 4 words) when the criterion had been reached. The criterion was three consecutive correct responses for the meaning and pronunciation of all 4 characters in one of the experimental conditions. The proportions of correct responses for pronunciations and meanings were averaged for each experimental condition.

The mean proportions of correct responses for meaning are presented in Figure 1. The two feedback conditions achieved a higher correct response rate for meaning acquisition than the two simultaneous conditions. That is, a significant difference was found between the feedback conditions and simultaneous conditions \( F(1,11) = 10.82, p<0.01 \). In contrast, there was no significant impact observed on the meaning acquisition in both procedures due to the presence or absence of pinyin. The data showed that there was no significant difference between the presence of pinyin and absence of pinyin \( F(1,11) = 0.01, p>0.05 \). The interaction of these two factors was not significant \( F(1,11) = 0.10, p>0.05 \).

Fig 1. The mean proportion correct obtained for the Standard Character Pinyin Meaning Condition (SPM), Standard Character Sound Meaning Condition (SM); Feedback Character Pinyin Meaning Condition (FPM), Feedback Character Sound Meaning Condition (FM).

The mean proportions of correct responses for pronunciation are displayed in Figure 2. The two feedback conditions achieved a higher correct response rate for pronunciation acquisition. That is, the difference between the feedback conditions and simultaneous conditions was significant \( F(1,11) = 6.35, p<0.05 \). In addition, the presence of pinyin achieved a higher correct response than the absence of pinyin for both feedback and simultaneous conditions. The data indicated that a significant difference was detected between the presence of pinyin and the absence of pinyin \( F(1,11) = 13.49, p<0.05 \). The interaction of these two factors was not significant \( F(1,11) = 2.77, p>0.05 \).

Fig 2. The mean proportion correct obtained for the Standard Character Pinyin Meaning Condition (SPM), Standard Character Sound Meaning
DISCUSSION

The present results suggested that the simultaneous presentation of characters with their pinyin and English equivalents interfered with the meaning and pronunciation acquisition of the characters. This was demonstrated in the results where the correct meaning and pronunciation responses were recalled better with pinyin and English equivalents in the feedback than in the simultaneous presentations. That is, the reduction of blocking by spacing the presentation between the characters and their pinyin and English equivalents was found to enhance the meaning and pronunciation acquisition of the characters. This is contrary to the conventional belief that pinyin and first language can provide useful information and help memory learning for beginning learners when the characters are paired with their pinyin and first language equivalents. It also supports the blocking hypothesis which suggests that allowing cue A (e.g., pinyin and first language) to become a good predictor of the response blocks cue B (e.g., character) from attaining as much associative strength as B (e.g., character) would have otherwise obtained (Kamin, 1969). These findings are also consistent with the blocking explanation of the picture-word problems which suggest that the familiarity with pictures can inhibit the formation of written word-spoken word association when picture and word are presented together (e.g., Singh & Solman, 1990; Solman & Wu, 1995; Wu & Solman, 1993). Further, related investigations into the teaching of second language vocabulary have shown that the presentation of the second language words with their first language equivalents during learning depresses the rate at which second language words are learnt (Solman & Adepoju, 1995; Solman & Chung, 1996).

In addition, the results obtained for meaning indicated that on the presentation of a character the presence of pinyin did not improve the meaning acquisition for both simultaneous and feedback procedures. This suggests that neither the different levels of phonemes nor the completed pinyin are indirectly assisting the meaning acquisition of the character. The results generally indicate that the meaning acquisition is independent of the pronunciation acquisition of the characters.

The results also showed that the pronunciation was recalled significantly better with the presence of pinyin than in the absence of pinyin for both simultaneous and feedback conditions. This is probably because the pinyin provides a guide to the pronunciation by supplying the visual representation of the sound. In fact, it may be argued that the presence of pinyin may increase the amount of cognitive effort to decode the pronunciation of the character more deeply. It is generally accepted that memory and learning improve as the amount of the cognitive effort increases (Sweller, 1994). It is reasonable to suggest that the pronunciation of a new character is unfamiliar to the learner,
therefore considerable amount of the cognitive activity is needed to process the individual phoneme. That is, when a character is presented with its pinyin, the presence of pinyin helps to trigger the phonological activation which involves translating the orthographic information into sound through the different activation of phoneme levels and then recognising the identity of a character from its pronunciation. Thus, the presence of pinyin improves the pronunciation acquisition. However, in the absence of pinyin, the need to devote the amount of the cognitive effort to the process of the phonological decoding may be reduced compared with the presence of pinyin. In the absence of pinyin, the pronunciation of the character is given verbally, and the learner will hear the pronunciation as a whole unit of sound without using any conscious effort and thought. Hence, this may not involve the deeper processing of pronunciation for a new character and thus may lead to decline the learning of the pronunciation of a character. In general, it may be the case that the presence of pinyin assists the pronunciation acquisition of characters.

The results of this study have direct and immediate implications for teaching of Chinese characters. Findings from this study and other related studies (e.g., Solman & Adepoju, 1995; Solman & Chung, 1996; Wu & Solman, 1993) indicate the conventional simultaneous presentation of words with their extra cues blocks meaning and pronunciation acquisition, whereas the use of extra cues in the feedback presentation enhances learning since the delayed presentation of these prompts neutralise the negative effect of blocking. The present findings also indicate that the presence of pinyin improves the learning of pronunciation. That is, we recommend the use of pinyin and the adoption of the feedback presentation approach when teaching Chinese characters.

REFERENCES

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