Short-term Serial Recall Performance by Good and Poor Readers of Chinese

Nianqi Ren† and Ignatius G. Mattingly†

Chinese second-grade students who had been classified either as “good readers” or as “poor readers” were subjects in a visual serial recall experiment in which the items in the series to be remembered were Chinese characters. Three series types were used: orthographically similar, phonologically similar, and nonsimilar. The same students were subjects in a parallel auditory serial recall experiment in which the items to be remembered were spoken Chinese words, and the series were phonologically similar or nonsimilar. The results of these experiments were broadly parallel to the results of experiments with good and poor readers of English: Good readers performed better than poor readers and, in the visual experiment, were relatively more affected by phonologically similar series than the poor readers. It is concluded that, whether the writing system is alphabetic or nonalphabetic, the phonological mechanism used in short-term recall of visually-presented verbal material is the same mechanism that is used for reading. This mechanism is, in fact, the linguistic module that controls speaking and listening. Representations of phonological segmental structure are automatically computed by the module, even though they may have no apparent relevance for a particular linguistic task, such as the reading of Chinese characters.

A correlation has been clearly demonstrated between the ability of young children to read an alphabetic orthography and their performance in tasks requiring serial recall of alphabetic material: good readers recall more than poor readers (Shankweiler, Liberman, Mark, Fowler, & Fischer, 1979). Here we investigate whether a similar correlation can be found for young readers of a nonalphabetic orthography, that of Chinese.

It is generally accepted that material to be remembered for more than a few milliseconds is coded phonologically, if such a coding is possible. Such phonological coding has been demonstrated in serial recall experiments not only for spoken utterances (Wickelgren, 1965, 1966), but also for pictures of nameable objects (Conrad, 1972), letters (Conrad, 1964; Conrad & Hull, 1964), alphabetically-written words (Kintsch & Buschke, 1969), Chinese logograms (Tzeng, Hung, & Wang, 1977), Japanese logograms (Erickson, Mattingly, & Turvey, 1977), and American Sign Language signs with obvious English equivalents (Hanson, 1982). When subjects try to recall a series of such items, the errors they make are most reasonably interpreted as phonological confusions. Moreover, if a series to be recalled consists of phonologically similar items, more errors will be observed for this series than for a nonsimilar series. Apparently, the mechanism subjects use to remember verbal material is phonological, even in a condition that might seem to favor use of a non-phonological mechanism if one were available. This phonological mechanism may be, as Baddeley and Hitch (1974) propose, a buffer in “working memory.” Or it may be, as we will argue, that “working memory” or “verbal short-term memory” is simply the rehearsal of verbal material with the aid of the linguistic mechanism or module (Fodor,
1983) that supports speaking and listening, and that necessarily produces phonological (indeed, linguistic) representations.

But, while orthographic items may be phonologically encoded for memorial purposes, it does not necessarily follow that reading requires phonological encoding. A reader is ordinarily trying, not to remember a text verbatim, but to understand it. It is thus of great interest that, in fact, a correlation has been demonstrated between the ability of young children to read in an alphabetic orthography and their serial recall of alphabetic material (Shankweiler et al., 1979). These investigators asked good and poor second-grade readers to recall visually-presented series of letters and auditorially-presented series of letter-names. The letter-names in some series were phonologically similar, i.e., rhymed (e.g., B, C, D, G, P) and in other series were non-similar (e.g., H, K, L, Q, R). It was found that in both modes of presentation, good readers recall more than poor readers, and are more affected by phonological similarity than poor readers. Similar results have been found for spoken words and sentences (Mann, Liberman, & Shankweiler, 1980).

Evidently, alphabetic reading and serial recall are relying on the same phonological mechanism. This finding is surely an important clue to the nature of the reading process, but we would be better able to interpret it if we knew whether the correlation is specific to alphabetic reading or obtains for the reading of nonalphabetic orthographies as well. If no correlation were found for nonalphabetic reading, we would conclude that because of its segmental character, alphabetic orthography makes some special demand on phonological processes also used in working memory, while for nonalphabetic orthographies, in which the symbols correspond to larger linguistic units, there is no obvious reason for phonological segments to have any role in reading unless the text is to be remembered. On the other hand, if a correlation were found for nonalphabetic orthography, we would be led to conclude that, regardless of the particular character of the orthography, phonological processes are intrinsic to reading, either because reading requires working memory, as Baddeley (1979) has argued, or because reading, like the remembering of verbal material, necessarily relies on the language module.

Some recent work with Japanese second-graders encourages the expectation of a correlation for nonalphabetic orthographies (Mann, 1985). In this study, a group of good readers and a group of poor readers were asked to remember both auditory and visual stimuli in a recurring recognition paradigm (Kimura, 1963). The auditory material consisted of Japanese nonsense syllables; the visual material, of abstract designs, photographs of male Japanese faces, hiragana symbols that in the Japanese writing system represent phonological moras, and kanji characters that in this writing system represent morphemes. The good readers performed better than the poor readers on the phonologically codeable material—the nonsense syllables, the hiragana and the kanji—but not on the abstract designs or faces. However, this study did not vary phonological similarity systematically, and it used a paradigm that minimized the effects of rehearsal.

The present investigation is concerned with the reading of the other major nonalphabetic orthography in modern use, Chinese. Spoken Chinese is, in fact, a group of dialects that, although having a common historical origin, are now quite different from one another, and, not necessarily even mutually intelligible. The differences, however, are mainly phonological; the syntax and the basic stock of monosyllabic morphemes inherited from Classical Chinese is common to all the dialects. Traditionally, the same writing system could be used for these different dialects because its characters stand for these common morphemes. Thus 石 stands for the morpheme that is pronounced [si] in Mandarin and [zaʔ] in Shanghainese, and means 'stone' in both. A Chinese morpheme may function either as a monomorphemic word or as constituent of a polymorphemic word, but this distinction is not indicated in the writing. There are spaces between characters but no specific word-boundary markers.

The character 石, and many others, are unitary signs, but over 90% of the characters used in modern Chinese writing are "phonetic compounds." A phonetic compound has two parts, the "signific" and the "phonetic," each of which can, in general, appear also as a separate, free-standing character. The signific is usually at the left or the top of the compound character; the phonetic at the right or the bottom. In principle, the signific is supposed to indicate the semantic category of the morpheme that the compound character stands for; the phonetic, its pronunciation. For instance, the character 材 (in the pinyin Romanization, with tone-marking added), 'lumber,' consists of a signific,
that, as a separate character, stands for 木 ‘wood’; and a phonetic 才 that, as a separate character, stands for 聘 ‘talented person.’ But because of changes in both language and writing system over a long period, neither the signific nor the phonetic now necessarily provide very reliable information. For instance, 堂, 木 păng, ‘hall’ consists of the signific 木, ‘earth’ and the phonetic 尚, ‘esteem.’

During their first two years of school, children in the People’s Republic of China, regardless of their native dialect, are required to learn Putong Hua (“the common speech”), that is, Mandarin, the idealization of the Beijing dialect that is the official language of the P.R.C. They also learn pinyin, the official Romanization system for Mandarin. And most remarkably, they learn to recognize, write, pronounce in Mandarin, and use in sentences some 1400 Chinese characters. (In later years of elementary schooling, they learn many more). Thus, except for native speakers of the Beijing dialect, Chinese children learn to read in their second language.

The experiments on Chinese we report here are comparable to the Shankweiler et al. (1979) serial recall experiments. Like those researchers, we investigated the ability of good and poor readers to recall linguistic material presented visually and auditorially. But the items to be recalled in their experiments were letters and spoken letter-names, while in our experiments the items were Chinese characters and spoken monomorphemic Mandarin words. There were also certain methodological differences. They compared simultaneous and sequential visual presentation of the items in a series; we used only sequential presentation. In the visual presentation, we included an orthographically similar condition; they did not. They compared performance with immediate and considerably delayed subject response; we simply used a moderately delayed response. They required a written response to the auditory as well as to the visual presentation; we required a spoken response to the auditory presentation. Perhaps most important, they required their subjects to report the entire series after each trial, while we used a Waugh-Norman procedure (Waugh & Norman, 1965), so that the subjects reported only a single item.

EXPERIMENT 1: VISUAL PRESENTATION

Subjects
The subjects used in both the visual and the auditory experiments were native speakers of Shanghainese completing the second grade in several different classes in an elementary school in Shanghai. The principle for selecting “good readers” and “poor readers” was that the two groups should differ in reading ability, but not in general intelligence. Thus, the recommendation of classroom teachers and scores on the final examination in reading at the end of second grade were used to define the two groups, but students who had done poorly on the final examination in mathematics were excluded. This procedure yielded 40 candidate good readers and 40 candidate poor readers. Then the Draw-a-Man IQ test (Goodenough, 1926) was given to 78 of these students (two were not available), and those whose IQ scores fell outside the range 90-120 were eliminated, leaving 25 good readers and 25 poor readers. Two of the poor readers failed to attend, so that 25 good readers and 23 poor readers actually took part in the experiments. The good readers ranged in age from 90 to 104 months; the average was 98. Their IQs ranged from 96 to 118; the average was 107. The poor readers ranged in age from 90 to 107 months; the average was 99. Their IQs ranged from 92 to 120; the average was 103.

Materials
All the characters used in the experiment were drawn from the inventory of characters that Chinese children are expected to know by the end of second grade. Fifteen series of six characters each were prepared; they are given in the Appendix. This series length had been found, in pilot testing, to yield a useful range in number of recall errors for both the best-performing and poorest-performing subjects. The series were of three types. In an “orthographically similar” (OS) series, the characters all had the same signific, but the monomorphemic words for which they stood had no particular phonological resemblance to one another, either in Mandarin or in Shanghainese, nor (except perhaps from a historical standpoint) were they semantically related. In a “phonologically similar” (PS) series, all the words for which the characters stood rhymed and had the same tone, whether read as Mandarin or as Shanghainese, but they were semantically unrelated, and the characters had no
significs or phonetics in common. In a “nonsimilar” (NS) series, neither the characters nor the words for which they stood had any common properties. There were five series of each type. Altogether, 90 different characters were used, none more than once. A separate 2” × 2” slide was made from a drawing of each character.

Procedure

The characters were shown by a slide projector, in black and white, on a large screen at a comfortable distance from the subject. The rate and duration of presentation were controlled by a timer attached to the projector.

A Waugh-Norman paradigm was employed. On each trial, a six-character series was presented sequentially. Each character was visible for approximately 1.5 seconds, and there was an interstimulus interval of .2 seconds. After a delay of four seconds, one of the first five characters in the series was presented again, as a “probe,” and the subject was required to write down the character that had followed the probe in the series. An advantage of this procedure, compared with one in which the subject must write down the entire series, is that there is less opportunity for differences in handwriting ability to confound in black and white, on a large screen at a comfortable distance from the subject. The rate and duration of presentation were controlled by a timer attached to the projector.

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Within each series type, a word at a different serial position served as the probe in each of the five series. The ordering of trials was randomized with respect to series type and probe position.

The subjects were tested individually. Before the actual test trials, the subject was given at least three practice trials, and the test did not begin until it was clear that the subject understood the task.

After the main experiment had been carried out, each subject was shown each of the 90 characters and asked to pronounce it. The average error rate for the 48 subjects was 2.5%. Nineteen subjects performed this task perfectly, and none had an error rate greater than 8%. Errors in the main experiment may thus be confidently interpreted as predominantly errors of recall rather than errors of recognition.

Results and Discussion

The results are shown in Figure 1 and Figure 2 (left). In Figure 1, each panel shows the percentage of correct responses at each serial position for one of the three types of trial, with reading ability as the parameter. In Figure 2, the percentages of correct responses for good readers and poor readers and for each trial type are collapsed across serial position.

An analysis of variance was performed on reading ability (good or poor), trial type (OS, PS, NS), and serial position (2 through 6) of the character probed for.

As would be expected from the results of many other experiments in serial recall of verbal material, performance generally declined across earlier serial positions (2 to 4) and improved across later positions (4 to 6), and there is a significant main effect of serial position [F(4, 184) = 20.72, p < .001].

Overall performance was best on the OS trials, slightly poorer on the NS trials, and considerably poorer on the PS trials, and there is a significant main effect of trial type [F(2, 92) = 13.50, p < .001]. A contrast analysis showed that there was no significant difference between performance on NS and on OS trials [F(1, 46) < 1], but that performance on PS trials was significantly poorer than performance on either NS trials [F(1, 46) = 17.33, p < .001] or OS trials [F(1, 46) = 24.13, p < .001]. Performance was especially poor for medial serial positions on PS trials, and there is a significant interaction between serial position and trial type [F(8, 368) = 3.10, p < .005].

As shown in Figure 2 (left), the overall performance of the good readers was much better than that of the poor readers, and there is a significant main effect of reading ability [F(1, 46) = 11.95, p < .005]. The effects of serial position on good readers and poor readers were similar, and there is no significant interaction between reading ability and serial position F(4, 184) < 1).

The effects of trial type on good readers and poor readers were different. While the good readers performed better than the poor readers on all three trial types, the difference in performance was significant for NS trials [F(1,46) = 12.54, p < .001] and for OS trials [F(1,46) = 66.33, p < .05], but not for PS trials [F(1,46) < 1]. There is an interaction between reading ability and trial type that falls just short of significance [F(2, 92) = 3.00, p = .055]. If just the NS and PS types are considered, this interaction is clearly significant [F(1,46) = 5.88, p < .05]: good readers were more affected by phonological similarity than were poor readers. In fact, good readers performed significantly better on NS trials than on PS trials [F(1,24) = 18.53, p < .001], but poor readers did not [F(1,22) = 1.96, p > .05].
Figure 1. Percentage of correct recall of visually-presented Chinese characters by good readers and by poor readers, at each serial position, for OS, NS and PS trial types.
Neither group performed significantly differently on the OS trials than on the NS trials (good readers: $F(1,24) < 1$; poor readers: $F(1, 22) < 1$). It might therefore be expected that a comparison of the PS and OS trials would parallel the comparison between PS and NS trials. But this proves not to be the case, because, as can be seen from Figure 2, the poor readers actually performed slightly better on the OS trials than would be expected from their performance on the NS trials. As a result, poor readers performed significantly better on OS trials than on PS trials ($F(1,22) = 7.36, p < .05$), just as did good readers ($F(1,24) = 17.55, p < .001$); and if just OS and PS types are considered, there is no significant interaction between reading ability and trial type ($F(1,46) = 2.891, p > .05$).

The results of Experiment 1 parallel the findings of Shankweiler et al. for recall of letters by good and poor readers of English. The ability to recall a string of characters correlates with reading ability in Chinese, just as the ability to recall a string of letters correlates with reading ability in English. Phonological similarity affects the performance of good readers more than it does the performance of poor readers. Orthographic similarity, not explored by Shankweiler et al. for English writing, but certainly a plausible potential source of confusion in the case of Chinese writing, in fact has no effect.

**EXPERIMENT 2: AUDITORY PRESENTATION**

**Materials**

The materials were the series of spoken monomorphemic Mandarin words corresponding to the five series of phonologically similar characters and the five series of nonsimilar characters in Experiment 1. These series were tape-recorded by the first author, a native speaker of Shanghainese who is fluent in Mandarin. The format in which the material was recorded paralleled the procedure of Experiment 1, but the order of trials was determined by a different randomization, and in each trial, a word at a different serial position served as the probe. A metronome was used to control the rate at which the words in a series were spoken. There was an interval of 2 seconds between the onsets of successive words in a series, and the onset of the probe word occurred 4 seconds after the onset of the last word of a series.

**Procedure**

The procedure was parallel to that of Experiment 1. The subject heard each series and the following probe word over a loudspeaker, and responded by speaking a word. This response was tape-recorded.

**Results and Discussion**

The results for the auditory presentation are shown in Figure 2 (right) and Figure 3.
Figure 3. Percentage of correct recall of auditorially-presented Chinese words by good readers and by poor readers, at each serial position, for NS and PS trial types.
An analysis of variance was performed; the factors were the same as for the analysis in Experiment 1, except that only two trial types had to be considered. Recall is much better for position 6 than for earlier positions, and there is a significant main effect of serial position \(F(4, 43) = 16.63, p < .001\). Performance on NS trials is significantly better than on PS trials \(F(1, 46) = 13.40, p < .001\). (The graphs of the responses in the NS condition show an unexpected dip at position 5; this happened because, for this position in this particular sequence, we had inadvertently selected a word that was phonologically similar to the preceding word that served as the probe.) Good readers perform significantly better than poor readers \(F(1, 46) = 13.21, p < .001\). But it should be noted that this is not true for position 6, at which the good readers and poor readers perform equally well. It may be that a spoken response for later positions in auditory presentation relies on echoic memory as well as, or rather than, phonological memory (Crowder & Morton, 1969).

If so, differential effects of phonological similarity would be less obvious than with written responses to visually presented stimuli. At any rate, and in contrast with the results for visual presentation, good readers and poor readers are about equally disadvantaged by phonological similarity, and the interaction between reading ability and trial type is not significant. Nor is there any significant interaction for any other combination of factors.

Auditory and visual performance for each serial position are compared in Figure 4, combining across reading ability and NS and PS trial types. Another analysis of variance was made for the responses by all subjects to PS trials and NS trials in both experiments. In addition to the factors considered in the previous analyses, the within-subjects factor modality of presentation (visual or auditory) was added. Performance with auditory presentation is better than with visual presentation, and there is, accordingly, a significant main effect of modality \(F(1, 46) = 6.45, p < .05\).

![Figure 4. Percentage of correct recall of visually-presented Chinese characters and of the corresponding auditorially-presented Chinese words, at each serial position, combined across reading ability (good and poor) and trial type (NS and PS).](image-url)
Serial position functions differ across modality, with performance in medial positions being better, relative to performance in early positions, in the auditory modality. Thus there is a significant interaction between modality and serial position \([F(4, 43) = 3.99, p < .01]\). Good readers perform well at the last position in both modes, whereas the performance of poor readers at this position is poor with visual presentation but, as we have just noted, equal to that of the good readers with auditory presentation. Hence there is a significant interaction between modality, serial position and reading ability \([F(4, 43) = 2.82, p < .05]\). There were no other interactions with modality, even though, given a significant interaction between trial type and reading ability with visual presentation, but not with auditory presentation, a three-way interaction among trial type, reading ability, and modality might have been expected.

In the auditory presentation, good and poor Chinese readers differed in their performance, just as Shankweiler et al.'s good and poor English readers did. Phonological similarity, as would be expected, reduced performance. But, probably for methodological reasons, a differential effect of phonological similarity on good readers and on poor readers was not demonstrated, in contrast with the finding of Shankweiler et al. Auditory performance was better than visual performance, but given necessary differences in experimental procedures, no special importance can be assigned to this result.

**General Discussion**

In serial-recall experiments in which the items to be remembered were Chinese characters and the corresponding spoken Mandarin words, and the subjects were young readers of Chinese, we have obtained results essentially parallel to those obtained by Shankweiler et al. (1979), in experiments in which the items were Roman letters and their spoken English names, and the subjects were young readers of English. We found that the ability of Chinese subjects to read Chinese, like the ability of English subjects to read English, correlated with the efficiency of the mechanism used for serial recall of verbal material, whether spoken or written. As has long been recognized, this mechanism is, in some important sense, phonological.

Our findings suggest several conclusions. First, this phonological mechanism is clearly needed for the reading of Chinese and presumably of other nonalphabetic orthographies, and the mechanism is of such importance that its relative efficiency distinguishes good readers from poor readers. This is what might have been expected, indeed, given earlier serial recall experiments with nonalphabetic orthographies, and given also experiments for both English and Chinese demonstrating that phonetic distractor tasks slow down detection of sentence anomaly (Kleiman, 1975; Tzeng et al., 1977). But it would still have been possible to maintain, before the present results, that reading was not the same process as short-term recall or sentence-anomaly detection, and, at least in the case of a nonalphabetic orthography, need not involve a phonological mechanism.

Second, there may not be very many different ways to read; perhaps only one. Given the apparent variety in the orthographies that have been and continue to be used by different cultures, it might have been supposed that there were many different possible cognitive strategies for reading and writing. But closer inspection of these orthographies reveals that there are really just two basic types, one of which employs syllabic units and the other, phonemic units (Gelb, 1963). Now, the present experiment indicates that even this significant structural difference is not crucial, for the reading of the two orthographic types relies on the same mechanism.

Third, the nature and cognitive status of this phonological mechanism needs to be reconsidered. According to a widely-held view, the mechanism is "working memory," used for cognitive problem-solving tasks, including the parsing and understanding of sentences. Working memory includes a phonological buffer in which words are stored while awaiting higher-level processing, as in sentence understanding, or simply when short-term verbatim retention is required, as when a name or a number is temporarily remembered (Baddeley & Hitch, 1974). On this thoroughly "horizontal" account, a memorial mechanism that happens to be phonological supports various higher-level cognitive processes, of which sentence-processing is merely one.

It has never been quite clear whether the contents of the phonological buffer in working memory were supposed to derive immediately from the spoken or written input, before lexical access, or from phonological specifications in lexical entries, after lexical access. On the former assumption, it is difficult to explain the results of short-term serial recall experiments with nonalphabetic writing; surely, the lexical entries for Chinese words would have to be accessed to get the segments into the phonological buffer. On the
latter assumption, the difficulty is that what would appear to be required for post-lexical parsing is the syntactic and semantic information stored in the lexicon for words, rather than the phonological information. The results of the present experiment further embarrass the "working memory" account. The problem is that the mechanism that appears to be used by readers of Chinese, as well as by recallers of Chinese and readers and recallers of English, deals in phonological segments, and is therefore inhibited by similarity of such segments in a serial recall task. Why should such mechanism be used at all for reading the Chinese orthography, in which the units are morphosyllabic, not segmental? If we insist on the working-memory account, we have to say that readers of Chinese will not be very efficient unless they are able to access and temporarily store information that is not directly specified in the input and would appear to be quite irrelevant to sentence-parsing and sentence understanding.

A way around this difficulty is to be found in a "vertical" account, according to which the phonological mechanism is not as a general-purpose "working memory" system, but a language module, in the sense of Fodor (1983). The language module controls the primary processes of speaking and listening and is exploited, we would claim, in the secondary processes of reading and writing. The language module provides cognition with a representation of the linguistic structure of an utterance, including its segmental phonological structure; it also represents in some way the meaning of the utterance. The operation of the module, in the presence of appropriate stimulation, is automatic and compulsory; it always outputs these representations, even if they are of no use on a given occasion. Thus, whether the module is used for the reading of Chinese or of English, its output will include phonological structure; variations in orthographic structure do not affect the character of the output. Moreover, because the representation of phonological structure is part of the output, there is no need to attribute its existence to the requirements of sentence parsing. The module doubtless employs various intermediate representations in its computations, but there is no reason to identify its output with any of them.

From this point of view, "short-term memory" and "working memory" are merely somewhat misleading names for further ways in which cognition can exploit the ability of the language module to compute representations. Verbal material is temporarily remembered by rehearsal, that is, by the repeated computation of a fresh linguistic representation from a previously computed, now decaying one. Propositions needed for problem-solving are maintained in the mind by rehearsing sentences that assert them.

A modular account of reading, to be sure, has problems of its own. It has to be explained how a system that is presumed to be biologically specialized for speaking and listening to speech can be effectively accessed using arbitrary and conventional signs in another modality. (For some speculation on this question, see Mattingly, 1991.)

Finally, we would claim that it is perhaps for learning to read, rather than for the actual process of reading, that differences in orthographic structure are most significant. Mastering a sufficient inventory of Chinese characters requires years of memorization; it does not, however, require the segmental phonological awareness that alphabetic writing both demands and fosters in the reader (Mattingly, 1972). It is sometimes suggested that phonological awareness has some direct connection with the phonological mechanism discussed earlier, as if limitations of awareness might be explained by, or might themselves account for, limitations of this mechanism (Shankweiler & Crain, 1986). The present experiments, however, provide no encouragement for this "unitary" view, for they show that the phonological mechanism, that is, the language module, is necessary for the reading of an orthography for which segmental awareness is not necessary. It appears to be one thing for the module to produce linguistic representations efficiently; another, for the reader to become aware of the particular aspect of these representations that alphabets exploit: their segmental character.

REFERENCES


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FOOTNOTE

†Also University of Connecticut, Storrs.
## APPENDIX: CHARACTER SERIES

### A. Orthographically similar

| 堂馆客室宝安 | 闹院更徙抗查 |
| fù gōng kè shì bǎo ān | nào yuàn gèng tú kàng chá |
| 样村林材枝校 | 桌墙民黑同忆 |
| yànɡ cūn lín cái zhī xiào | zhuō qiánɡ mín hēi tónɡ yì |
| 伟他住什作件 | 千上盖玩澄有 |
| wěi lá zhù shén zuò jiàn | qiān shàng gài wán chén yǒu |
| 拼技报投拔拨 | 碰会斤郭菊赛 |
| pīn jì bào tóu bā bō | pèng huì jīn ɡǔ jú sài |
| 运这迈过远近 | 枯里虫漂分马 |
| yùn zhè mài yuǎn ɡuò jìn | kū lǐ chóng piāo fēn mǎ |

### B. Nonsimilar

### C. Phonologically similar

| 向让傍创亮望 | 空松中聪东工 |
| xiànɡ ràng bānɡ chuànɡ liànɡ wànɡ | kònɡ sōnɡ zhōnɡ cōnɡ dōnɡ gōnɡ |
| 貌道笑教科绕 | 床航防王狼忙 |
| mào dào xiào jiào kē rào | chuànɡ hànɡ fánɡ wánɡ lánɡ mánɡ |
| 首狗走斗丑口 | shǒu ɡǒu zǒu dòu chǒu kǒu |