## Chapter 3 The nonword classification task.

Nonword classification task in this study is based on Walley et al. (1986), which was used to test whether children can recognize the correspondences between two speech sounds and make use of them to classify the spoken sounds in term of the perception level.

When a child hears the target sound [paj], the child is asked whether the target sound is most like the sound [pu] or the sound [tow]. The child is expected to answer [pu]. The two sounds, [paj] and [pu], are alike in their initial phonemes whereas the two sounds [paj] and [tow] are different in all parts. Despite the simplicity of the task itself, it is not easy for 4- and 5- years old children to take the task. It has been found that young children are poor at the task which requires phonemic analysis (Liberman 1974). Young children tend to treat syllables as undifferentiated wholes (Treiman & Baron, 1981; Treiman & Breaux, 1982; Treiman, 1985). Presumably, for children, the overall sounds [pu], [tow], and [paj] are just three sounds that belong to different categories (Rozin & Gleitman 1977, Walley, Smith & Jusczyk 1980).

In this task, the young children are asked to classify more complex sounds (e.g. disyllabic sounds). The correct classification is based on single-segment correspondence, whole-syllable correspondence, or maximal correspondence. The

test sounds in this experiment are based on three conditions: single-segment correspondence (C___), whole-syllable correspondences (CV__) and maximal correspondences (CVC_). For example, when the child hears the target sound [pulɑw], he/she is asked whether the target sound is most like the standard sounds [puma] or [towpʰej]. He/She is expected to answer [puma]. The target sound [pulɑw] shares one syllable with the standard sound [puma] whereas the target sound [pulɑw] is different in all parts from the standard sound [towpʰej].

In this experiment, first children have to learn the two standard sounds. Then, children listen to a novel test sound and classify the test sound to each of the two standard sounds they have learned. That is, for each test stimuli, children are asked which standard sounds it belongs to. For example, the child is asked whether the test sound [pulɑw] goes with the standard sound [puma] or the other standard sound [towpʰej].

In adult studies (e.g. Blevins 1996 for theoretical framework, Wan 1997, 1999, 2002 for Mandarin performance errors), syllables are considered to play an important role in the phonological constituent. Besides, several experiments have shown that children can do well on the tasks which require the syllabic analysis in comparison with the tasks which require phonemic analysis (Liberman 1974, Treiman & Baron 1981, Treiman & Breaux 1982, Treiman 1985). It seems that syllables have the

advantages to form a natural domain for language processing in child's phonology.

The nonword classification task requires children's abilities of syllabic analysis and phonemic analysis to find out correct classification of the target sound. Besides, the test item, maximal correspondence (CV(C).C_), also helps to investigate children's psychological reality toward "size".

In this experiment, with the general agreement on the special status of syllables, I expect that young children would perform better on whole-syllable correspondence (CV__) than single-segment correspondence. With regard to findings in Walley et al's (1986), young children are expected to do even better on the items of maximal correspondences (CVC_). Therefore, I predict that the performances on maximal correspondence (CV(C).C__) would be better than whole syllable correspondence (CV(C).___) and than single phoneme correspondence (C__.__). If children rely more on maximal correspondences (CV(C).C__) rather than on whole syllable correspondence (CV(C).___), we may say that the size of the shared units is influential in child's phonology. The superiority of syllables over segments may be due to the syllables' advantage in quantity. If children show similar reliance on whole syllable correspondence and on maximal correspondence, we may say that the superiority of syllables over segments may be due to the syllables' advantages in the structure.

### 3.1 Subjects

Twenty-one children ranging from six to seven years old were recruited from a preschool in Jia-yi city and served as subjects for the experiments. All of the subjects were native speakers of the dialect of Mandarin spoken in Taiwan.

### 3.2 Materials

Six consonants [p, m, t, $p^h$, l, x] and six vowels [u, ɑ, ow, e, aj, aw] are selected to construct the test sounds in the experiment. The selected consonants, [p, m, t, $p^h$, l, x] and vowels [u, ɑ, ow, e, aj, aw] can be freely combined with each other in CV structure and CVG structure except for one combination [p] and [ow]. The phonotactic constraints in Mandarin is quite strong for not all the consonants can be freely combined with the vowels, e.g. consonant [f] and the vowel [ow] are not a legal combination in Mandarin.

Twenty-four disyllabic sounds are tested. The test sounds are based on either of the four types:

(1) C__.___: sharing one segment with the standard sound ( e.g., the test sound [paj lɑw] in Table 1, shares one phoneme correspondence with the standard sound [pu mɑ].)

(2) CV(C).___: sharing one syllable with the standard sounds (e.g., the test sound [tow laj] in Table 1 shares three or four segments (one syllable plus one

segment) with the standard sound [tow pʰɛj]).

(3) CV(C).C__: sharing maximal correspondences with the standard sounds (E.g. the test sound [pu maj] in Table 1 shares three phonemes similarity with the standard sound [pu mɑ].

The standard sounds and test sounds which base on types C___, CV(C).___ and CV(C). C__ are shown in Table 1 and 2.

Table 1: The materials used in nonword classification task-set 1

| **Standard sounds** | |
|---|---|
| **pu**55-**mɑ**35 | **tow**55-**pʰ ej**35 |

| **Test sounds** | | |
|---|---|---|
| **C___ : one phoneme correspondence** | **p**aj51-**l**ɑw55 | **t**aj51-**l**aw55 |
| | **p**ɑw55-xaj51 | **t**ɑw55-laj51 |
| **CV(C).___: whole syllable correspondence** | **pu**5l-aj51 | **tow**55-laj51 |
| | **pu**55-xɑw55 | **tow**55-xɑw55 |
| **CV(C).C__ : maximal correspondence** | **pu**55-**m**ɑw55 | **tow**55-**pʰ**ɑw55 |
| | **pu**55-**m**aj51 | **tow**55-**pʰ**aj51 |

(The bold-face phonetics indicate its correspondent units with the standard sounds.)

Table 2 : The materials used in nonword classification task-set 2

| **Standard sounds** | |
|---|---|
| **mow**35-**tej**214 | **p$^{h}$aj**35-**lɑw**214 |

| **Stimulus sounds** | | |
|---|---|---|
| **C___ : one phoneme correspondence** | **m**u35-xɑ55 | **p$^{h}$**u35-xɑ55 |
| | **m**ɑ55-pu35 | **p$^{h}$**ɑ55-pu35 |
| **CV(C).___: whole syllable correspondence** | **mow**35-xu35 | **p$^{h}$aj**35-xu55 |
| | **mow**35-pɑ55 | **p$^{h}$aj**35-pɑ55 |
| **CV(C).C__ : maximal correspondence** | **mow**35-**t**ɑ55 | **p$^{h}$aj**35-**l**ɑ55 |
| | **mow**35-**t**u35 | **p$^{h}$aj**35-**l**u35 |

(The bold-face phonetics indicate its correspondent units with the standard sounds.)

Table 1 and Table 2 present the standard sounds and the test sounds in the nonword classification tasks.

All of the test sounds were recorded in a tape recorder using the voice of one male and one female University students who are the native speakers of Mandarin Chinese. The two students take turns pronouncing the test sound in a fixed pace. The same test sound is produced continuously three times at an interval of one second. Also, the occurrences of the test sounds are arranged in the random order. In order

to reinforce the child's intact memory of the two standard sounds, the standard sounds would show up at an interval of three test sounds during the test phase. Table 3 shows how the standard sounds appear at an interval of three test sounds.

Table 3: The random order of the test sounds with the insertions of the standard sounds

| | |
|---|---|
| 1. **mow**35 **tej**214 | 9. **mow**35 **tej**214 |
| 2. mow35 tu35 | 10. mow35 xu35 |
| 3. $p^h$aj35 xu55 | 11. $p^h$aj35 la55 |
| 4. $p^h$a55 pu35 | 12. $p^h$aj35 lu35 |
| 5. **$p^h$aj**35 **law**214 | 13. **$p^h$aj**35 **law**214 |
| 6. $p^h$u35 xa55 | 14. mu35 xa55 |
| 7. mow35 ta55 | 15. $p^h$aj35 pa55 |
| 8. mow35 pa55 | 16. ma55 pu35 |

(The bold face phonetics indicate the standard sounds in Table 2.)

### 3.3 Procedure and scoring

First, the experimenter presents the child with the two puppets, puppet A and puppet B and informs the child the names of each puppet, e.g. [**pu ma**] for puppet A and [**tow $p^h$ej**] for puppet B. The names of each puppet represent the standard sounds. The child had to repeat the names after the experimenter. Second, the

experimenter had to make sure that the child memorized the names of the two puppets by asking the subject to touch the head of the puppet when the experimenter pronounced the name of one puppet. Third, the child was told that he/she was going to listen to series of sounds and he/she needs to classify the sounds according the names of the puppets, e.g. when the subject hears the test sound [paj law], he/she has to decide whether this test sound belongs to puppet A, [pu mɑ] or puppet B [tow $p^h$ej] by patting the head of the puppet. Fourth, before the testing phase begun, the practice trials are done in order to see if the child's comprehension is adequate to conduct this task. Then, the experimenter operates the tape recorder and the subject listens to the test sounds. The experimenter would stop the tape recorder whenever necessary for the child to complete his/her responses. In the phase of practice trials, the child would receive the feedback from the experimenter, but in the testing phase, the child receives no feedback from the experimenter, only the encouragement.

The experimenter is responsible for the recording of the child's responses. The experimenter draws a "check" to indicate the correct responses. When the child correctly classifies one test sound, he/she would get one point. Each child's score (performance) on the three types, C___, CV(C).___ and CV(C).C__, is submitted to the analysis of Repeated Measures.

### 3.4 Results and analysis

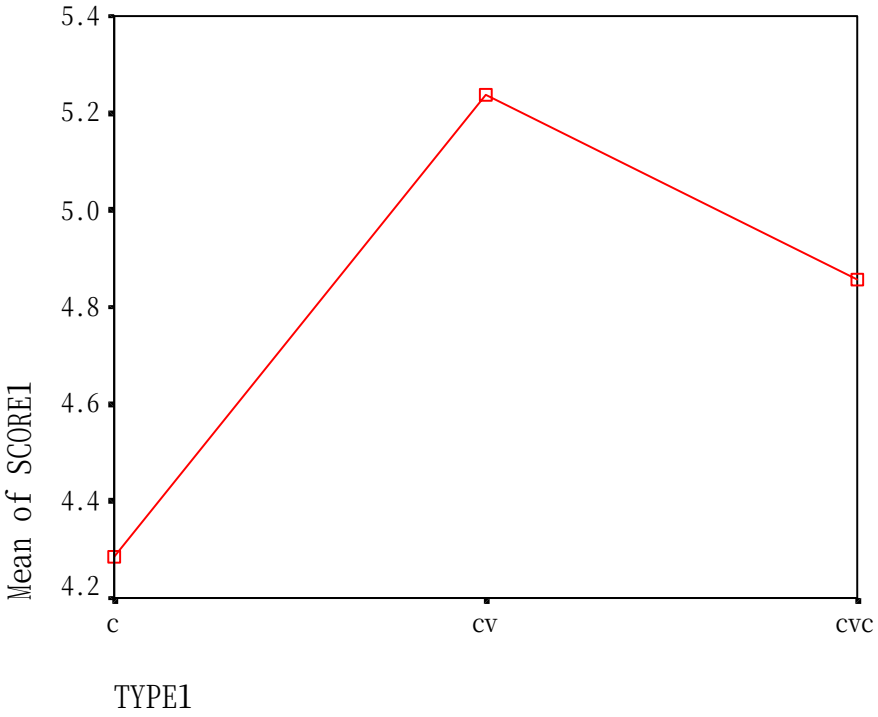
Table 4 presents the mean scores on each test type. The overall result revealed that the CV(C).___ type gets the highest score among the three types. The CV(C).C__ type is little higher the C___ type.

Table 4 : The results of the nonword classification tasks

| **Test types** | **Max** | **Mean** | **SD** | **N** |
|---|---|---|---|---|
| **One segment correspondence (C_.__ )** | 8 | 4.29 | 1.42 | 21 |
| **Whole syllable correspondence (CV(C).___ )** | 8 | 5.24 | 1.55 | 21 |
| **Maximal correspondence (CV(C).C__ )** | 8 | 4.86 | 2.10 | 21 |

Figure 1 shows the graph of the mean score in children's performances on the three test types.

Figure 1 : Means of three test types on nonword classification




(Mean of SCORE1= Mean of the nonword classification task, TYPE1= numbers of the shared units in the stimuli: C = the stimulus sounds share one segment with the standard sounds (C__.__), CV= the stimulus sounds share one syllable with the standard sounds (CV(C).___), and CVC= the stimulus sounds share the maximal correspondence with the standard sounds (CV(C).___). That is, the stimulus sound and the standard sound differed only in the rime of the second syllable.)

Table 5 : Tests of within-subjects effects

| Source | | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| **Types** | Sphericity Assumed | 9.651 | 2 | 4.83 | 2.55 | .091 |
| **Error(Types)** | Sphericity Assumed | 75.683 | 40 | 1.90 | | |

Table 5 presents the analysis of Repeated measures, which reveals that the differences among the three test item types do not reach the level of significant difference ($F(2, 40)=2.55$, $p>.05$).

The overall results showed that kindergarteners performed equally well on each test item type. Contrary to my expectations, CV(C).___ type failed to be the salient item for the kindergarteners in the classification of speech sounds.

As to the insignificance of the syllable correspondences, Walley et al (1986) found that English speaking kindergarteners, they did not show their reliance on the syllable correspondence (CV.__ type) in their nonword classification task. Instead, they found that the maximal correspondences (CV.C_ type) has played an important role for the young children in the classification task. However, I did not find the similar result in this experiment.