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<tr>
<th><strong>Title</strong></th>
<th>Phonological awareness of Cantonese-speaking preschool children with cochlear implants</th>
</tr>
</thead>
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<tr>
<td><strong>Author(s)</strong></td>
<td>Tse, Wing-ting; 謝穎婷</td>
</tr>
<tr>
<td><strong>Citation</strong></td>
<td>Tse, W. [謝穎婷]. (2009). Phonological awareness of Cantonese-speaking preschool children with cochlear implants. (Thesis). University of Hong Kong, Pokfulam, Hong Kong SAR.</td>
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</tr>
</tbody>
</table>
Phonological Awareness of Cantonese-Speaking Preschool Children

with Cochlear Implants

TSE Wing Ting

A dissertation submitted in partial fulfillment of the requirements for the Bachelor of Science (Speech and Hearing Sciences), The University of Hong Kong, June 30, 2009
Abstract

The study investigated the phonological awareness abilities of Cantonese-speaking preschoolers with cochlear implants. Participants were 15 Cantonese-speaking children with cochlear implants aged 3;08–6;10 chronological-age-matched with 15 normal hearing children. Each participant performed 10 tasks evaluating different levels of phonological awareness abilities and phonological knowledge. The results showed that preschoolers with cochlear implants and their hearing peers had similar level of syllable, phoneme, and rhyme awareness respectively. However, cochlear implant users performed significantly poorer than their hearing peers on tone awareness and phonological knowledge. This concluded that Cantonese-speaking preschoolers with cochlear implants were able to develop phonological awareness. However, cochlear implants might not provide enough tonal information for children with hearing impairment. Limited speech and language stimulation might affect phonological knowledge development.
Introduction

“Phonological awareness” refers to individual’s understanding of the phonological structure of a word of his or her language (Gillon, 2004). It is a multilevel skill of breaking down individual words into small units. Phonological awareness can further be described in terms of syllable awareness, phoneme awareness, rhyme awareness, as well as tone awareness for tonal language (Gillon, 2004). These reflect one’s ability to analyze the speech characteristics. Phonological knowledge is another type of phonological awareness reflecting one’s ability to understand the phonological rule of a specific language.

Previous studies in Cantonese speaking children evaluated the phonological awareness abilities of the children with normal development (Woo, 1993; Ho & Bryant, 1997), with language impairment (Wong, 1997), with developmental dyslexia (Ho, Law, & Ng, 2000), and with phonological disorder (So & Dodd, 2007). Recently, studies showed correlation between phonological awareness abilities and reading Chinese (Chow, McBride-Chang, & Burgess, 2005; Cheung et al, 2008; McBride-Chang & Ho, 2000). Other studies also suggested the evaluation of phonological awareness abilities as diagnostic clinical tools for risk of dyslexia for young Chinese children (Ho et al., 2000; McBride-Chang et al., 2008).

Chinese children developed phonological awareness from larger to smaller sound segments as English-speaking children (Ho & Bryant, 1997; Wong, 1997). Unlike English, Chinese has tone awareness as a unique feature for tonal language. Change in tones would
lead to alternation in lexical meaning. Cantonese is a tonal dialect of Chinese. Cantonese has six basic contrastive tones (Table 1). According to Fok Chan (1974), Cantonese tones change mainly according to the variations of the height and the contour of fundamental frequencies.

Typical developing Cantonese-speaking children in Hong Kong would be able to detect tones by age 5;0 (Ho & Bryant, 1997). They would then develop syllable awareness, followed by rhyme awareness, and lastly phoneme awareness (Ho & Bryant, 1997; Wong, 1997).

Table 1. Description of the Six Cantonese Lexical Tones.

<table>
<thead>
<tr>
<th>Tone</th>
<th>Characteristics of Fundamental Frequency (F₀)</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High Level</td>
<td>/si₅₅/  詩 poem</td>
</tr>
<tr>
<td>2</td>
<td>Mid-Low to High Rising</td>
<td>/tsₐu₂₅/ 酒 wine</td>
</tr>
<tr>
<td>3</td>
<td>Mid Level</td>
<td>/jiu₃₃/ 要 want</td>
</tr>
<tr>
<td>4</td>
<td>Mid-Low to Low Falling</td>
<td>/lₐi₂₁/ 泥 mud</td>
</tr>
<tr>
<td>5</td>
<td>Low to Mid-Low Rising</td>
<td>/nei₂₃/ 你 you</td>
</tr>
<tr>
<td>6</td>
<td>Mid-Low Level</td>
<td>/jₐt₂₂/ 日 sun</td>
</tr>
</tbody>
</table>

Hearing impaired population also raised concerns in various studies. Children with hearing impairment have difficulties in perceiving speech sounds. This would affect their phonological awareness development. Sterne and Goswami (2000) suggested that hearing impaired children did have phonological awareness. There are numerous studies focusing on the hearing-impaired population in alphabetic languages. Researches investigated the
phonological awareness abilities of hearing-impaired population in different aspects, including the effect of age of implantation of hearing device (James, Rajput, Brinton, & Goswami, 2007), the effect of using different hearing devices (James et al., 2005), the effect of degree of hearing loss (Theobald, 2005), etc.

Cochlear implant is an implanted electronic hearing device which can bypass the damaged hair cells to provide direct stimulation to intact auditory nerves in the inner ear (Dorman, 1998). Cochlear implants therefore can provide auditory sensory input for speech and language development. Individuals with severe or profound sensorineural hearing loss therefore can gain more benefits from cochlear implants than hearing aids. They can also gain some early auditory stimulation from hearing aids before implantation.

Studies revealed that the speech perception of hearing-impaired children improved with the use of cochlear implants (Wilson et al., 1991; Tyler et al, 1997). Those received implantation before aged 2;0 were likely to have age-appropriate spoken language abilities (Nicholas & Geers, 2007). They were able to perform at a similar level of expressive language as their hearing peers before entering kindergarten (Nicholas & Geers, 2007). James et al (2005) suggested that English-speaking paediatric cochlear implant users developed better phonological awareness abilities than those using hearing aids. English-speaking children with cochlear implants can develop phonological awareness but with a prolonged learning phase as compared with their hearing peers (Spencer & Tomblin, 2009).
Due to the difference in the phonological structure and the writing system of Chinese and English, those studies for English hearing-impaired population cannot be directly applied to Chinese population. For Cantonese-speaking population, previous study (Law, 1999) had only focused on the phonological awareness abilities of young adolescent wearing hearing aids. Researches of phonological awareness abilities for Cantonese-speaking children with hearing deficits were rare. Due to auditory deficits, children with cochlear implants were suspected to have impaired phonological awareness abilities. It would be worthwhile to investigate how the phonological awareness abilities of children with cochlear implants differ from typical-developing hearing children in Cantonese-speaking population and further evaluate their phonological awareness abilities.

There were two main purposes for this study. First, the study would compare the phonological awareness abilities between Cantonese-speaking preschool children with prelingual deafness using cochlear implants and their hearing age-matched peers. Second, the study would evaluate the phonological awareness abilities of Cantonese-speaking preschoolers with cochlear implants. This might contribute to a better understanding of the phonological awareness abilities of the hearing-impaired population, especially for those using cochlear implants. Speech therapists and educators might have a better expectation of the abilities of preschoolers with cochlear implants. This would be useful for planning future rehabilitation programs for children with hearing impairment.
In this study, the phonological awareness abilities of Cantonese-speaking children with cochlear implants and their hearing peers would be investigated in five different aspects, namely tone awareness, syllable awareness, phoneme awareness, rhyme awareness, and phonological knowledge. It was expected that the cochlear implant group and the normal hearing group would show similarities and differences in various areas of phonological awareness. This would further be described in the following paragraphs.

It was hypothesized that the hearing-impaired group will perform significantly poorer than the control group on tone awareness. It might be due to the poor identification and discrimination abilities for the Cantonese tones generally found in children with prelingual hearing impairment using cochlear implants (Wong & Wong, 2004; Ciocca, Francis, Aisha, & Wong, 2002). The cochlear implants might not provide enough tonal information for children with hearing impairment.

It was possible to suggest that syllable awareness between hearing-impaired group and the control group would not be significantly different. Both English and Cantonese hearing aids users with severe to profound hearing loss did not perform significantly different on syllable awareness as their hearing peers (Law, 1999; Sterne & Goswami, 2000). With better perception ability with cochlear implants than hearing aids (Wilson et al., 1991; Tyler et al., 1997), children with cochlear implants would probably show similar level on syllable awareness with their hearing age-matched peers.
The rhyme and phoneme awareness abilities of the two groups were hypothesized to have no significant difference. Although Law (1999) found that prelingual profound hearing loss subjects with hearing aids performed significantly poorer than the hearing group on rhyme and phoneme awareness, they still performed above the chance level for the tasks. This suggested that the hearing aids users were still able to develop rhyme and phoneme awareness. Their development would probably be restricted by their hearing abilities.

Introduction of cochlear implants to children with hearing impairment brings better speech perception (Wilson et al., 1991; Tyler et al., 1997) which might contribute to the phonological awareness development.

It was also hypothesized that the cochlear implant group might show restricted phonological knowledge. Compared with their hearing peers, the children with cochlear implants would have received less phonological and language stimulation. With reduced language and phonology input, they might have less developed phonological knowledge than their hearing peers as found in children with language delay (Wong, 1997).
Method

Participants

Fifteen native Cantonese-speaking preschool children aged from 3;08 to 6;10 with prelingual binaural hearing loss were recruited from local preschool child care centers. They were fitted with cochlear implants for at least one year. Ten of them received their implants before age 2;0. They had hearing aids for an average of 14 months before implantation. They received speech and hearing trainings within a year after fitting of hearing aids. Apart from hearing loss, they had no developmental or medical conditions that might affect their speech and language development. Details of their hearing conditions were obtained from their parents and the child care centers (summarized in Table 2). Seven of the participants had Advanced Bionics cochlear implants, five had Nucleus ESPrit 3G cochlear implants, two had MED-DL cochlear implants, and one had Clarion Platinum cochlear implant.

Another 15 native Cantonese-speaking preschool children with normal hearing were recruited from local kindergartens. They were matched with the hearing impaired participants as a normal hearing control group in terms of chronological age. The average age difference in each pair was within 4 months. A one-way analysis of variance showed that there was no significant age difference between the two groups ($F_{1,28} = 1.189, p = 0.285$). It was reported that all participants had no known hearing, visual, emotional, behavioral, physical, and cognitive impairment.
Table 2. Detailed information for the participants with cochlear implants

<table>
<thead>
<tr>
<th></th>
<th>CA (mos)</th>
<th>Sex</th>
<th>AI (mos)</th>
<th>HA exp (mos)</th>
<th>CI exp (mos)</th>
<th>Unaided L</th>
<th>Aided L</th>
<th>Unaided R</th>
<th>Aided R</th>
<th>Training since (mos)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>44</td>
<td>F</td>
<td>12</td>
<td>9</td>
<td>26</td>
<td>112</td>
<td>N/A</td>
<td>112</td>
<td>N/A</td>
<td>24</td>
</tr>
<tr>
<td>B</td>
<td>53</td>
<td>M</td>
<td>2</td>
<td>7</td>
<td>41</td>
<td>&gt;117</td>
<td>106</td>
<td>40</td>
<td>40</td>
<td>6</td>
</tr>
<tr>
<td>C</td>
<td>56</td>
<td>M</td>
<td>6</td>
<td>17</td>
<td>33</td>
<td>98</td>
<td>98</td>
<td>42</td>
<td>42</td>
<td>7</td>
</tr>
<tr>
<td>D</td>
<td>56</td>
<td>F</td>
<td>10</td>
<td>7</td>
<td>34</td>
<td>87</td>
<td>101</td>
<td>40</td>
<td>40</td>
<td>15</td>
</tr>
<tr>
<td>E</td>
<td>58</td>
<td>M</td>
<td>0</td>
<td>9</td>
<td>41</td>
<td>&gt;94</td>
<td>&gt;94</td>
<td>36</td>
<td>36</td>
<td>9</td>
</tr>
<tr>
<td>F</td>
<td>58</td>
<td>F</td>
<td>4</td>
<td>13</td>
<td>41</td>
<td>101</td>
<td>122</td>
<td>49</td>
<td>44</td>
<td>12</td>
</tr>
<tr>
<td>G</td>
<td>59</td>
<td>M</td>
<td>2</td>
<td>21</td>
<td>29</td>
<td>&gt;111</td>
<td>&gt;111</td>
<td>40</td>
<td>40</td>
<td>9</td>
</tr>
<tr>
<td>H</td>
<td>60</td>
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<td>6</td>
<td>9</td>
<td>40</td>
<td>&gt;119</td>
<td>&gt;119</td>
<td>38</td>
<td>38</td>
<td>12</td>
</tr>
<tr>
<td>I</td>
<td>63</td>
<td>M</td>
<td>1</td>
<td>13</td>
<td>47</td>
<td>111</td>
<td>&gt;117</td>
<td>40</td>
<td>40</td>
<td>16</td>
</tr>
<tr>
<td>J</td>
<td>63</td>
<td>F</td>
<td>33</td>
<td>14</td>
<td>17</td>
<td>&gt;112</td>
<td>79</td>
<td>49</td>
<td>49</td>
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<td>107</td>
<td>107</td>
<td>40</td>
<td>40</td>
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<tr>
<td>L</td>
<td>65</td>
<td>F</td>
<td>9</td>
<td>11</td>
<td>43</td>
<td>&gt;114</td>
<td>&gt;114</td>
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<td>49</td>
<td>22</td>
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<td>M</td>
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<td>F</td>
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<td>117</td>
<td>111</td>
<td>41</td>
<td>50</td>
<td>31</td>
</tr>
<tr>
<td>N</td>
<td>74</td>
<td>M</td>
<td>6</td>
<td>10</td>
<td>52</td>
<td>103</td>
<td>&gt;103</td>
<td>46</td>
<td>46</td>
<td>12</td>
</tr>
<tr>
<td>O</td>
<td>82</td>
<td>F</td>
<td>10</td>
<td>40</td>
<td>51</td>
<td>97.5</td>
<td>120</td>
<td>59</td>
<td>46</td>
<td>12</td>
</tr>
</tbody>
</table>

Remark:

CA = chronological age; mos = months; AI = age of hearing loss identified; HA exp = hearing aids experience before fitting cochlear implant; CI exp = cochlear implant experience; Unaided / Aided = unaided / aided hearing level in terms of dB (L = left; R = right); Training since = age first received speech and hearing therapy.
Procedures

All participants were tested individually in one 30-40 minute session. All sessions were held in a quiet room with background noise of 44-51dB and good lighting. Audio recording were made. Each participant performed ten informal phonological awareness tasks, adapted and modified from Wong (1997) and So & Dodd (2007). The phonological awareness tasks had been generally used for hearing children. The result of the study would allow a representative sample for the children with hearing impairment on phonological awareness for further comparison with different populations.

The tasks were presented randomly to counterbalance the effect of fatigue and task order. Verbal instructions were short and simple to ensure participants’ comprehension. Simple pictures were also used in demonstrating the tasks. Two practice trials were given for every single task to ensure the participants were able to understand the task. Specific feedbacks for the correctness of the practice trials were given; neutral feedbacks were given for the test trials. Stimuli for phoneme detection, phoneme identification, and rhyme detection were presented both verbally and visually in picture to reduce memory load; so as to minimize the chance of getting failure due to auditory memory ability (Ho & Bryant, 1997).

The ten tasks measured different levels of phonological awareness of the participants, including syllable awareness through syllable counting and syllable deletion; phoneme awareness through phoneme detection, phoneme identification and phoneme production;
rhyme awareness through rhyme detection and rhyme production; tone awareness through tone detection; as well as their knowledge on Cantonese phonological system through judgment, and repair. There were six items in the tasks of syllable counting, syllable deletion, phoneme detection, phoneme identification, phoneme production, rhyme detection, rhyme production, and judgment and repair; and 18 items in tone detection. The tasks were:

1. **Syllable counting** – Four pictures with different numbers of cars were presented before testing. The participants were asked to count the number of cars in each picture. This ensured that they had acquired counting concepts and were able to count. They were then asked to count the number of syllables (1-4) of each auditorily-presented word.

2. **Syllable deletion** – The participants were asked to delete one or two syllables from the orally presented di- or tri-syllabic words and said the remaining part of the words. Written words were presented only for the demonstration in the two practice trials as visual supports.

3. **Phoneme detection** – The experimenter orally presented three words while pointing to the corresponding pictures. The participants were asked to odd out the one with different initial phoneme.

4. **Phoneme identification** – The experimenter introduced pictures of a snake, wind, and a cow while producing the corresponding phoneme of /s/, /f/, and /m/ respectively.
The participants were invited to imitate the phonemes. The experimenter then presented the stimuli with initial phoneme /s/, /f/ or /m/ orally and asked the subjects to point to the corresponding picture for the same initial phoneme.

5. **Phoneme production** – The experimenter introduced the target phoneme. The participants were asked to generate a word started with it.

6. **Rhyme detection** – The experimenter first named the target picture and at the same time pointed to it, and followed by three choices. The participants were asked to select the one which is rhymed with the target.

7. **Rhyme production** – The participants were invited to repeat the word introduced. The participants were then asked to generate a word which was rhymed with it.

8. **Tone detection** – The experimenter read aloud a pair of words with identical segmental form which might be different or same in tone. The participants were asked to decide if the two paired words are identical.

9. **Judgment** and 10. **Repair** – The experimenter said a sentence (word length: 4-7) upon the presentation of the corresponding picture. The participants were asked to judge whether the experimenter said something silly or wrong and repair the error. Two of the sentences were ended with a familiar noun while the other four sentences were ended with a non-word by changing the place and/or manner of the initial phonemes of the target word.
Results

Each participant finished all ten phonological awareness tasks. The percentage correct response of each task was used for data analysis. According to the descriptive statistics (as shown in table 3), the two groups performed above chance level for all tasks.

General Comparison

In order to determine if the two groups performed differently overall and if the tasks had different level of difficulty, two-way analysis of variance 2(groups) x 10(tasks) for repeated measure was done. Significance level was set at 0.05. There was a significant task effect, $F_{9,252} = 58.306, p < 0.001$. The participants performed differently on the 10 phonological awareness tasks. This suggested that the tasks had different level of difficulties. There was also a significant group effect, $F_{1,28} = 6.197, p = 0.019$. The performance of cochlear implant group and normal hearing group was significantly different. However, there was no significant interaction effect between groups and tasks, $F_{9,252} = 1.343, p = 0.215$. Therefore, the two independent variables, groups and tasks, were not interacting with each other. Figure 1 provided a general comparison of the performance between the two groups.

The cochlear implant group generally performed poorer than the normal hearing group for the phonological awareness tasks, except phoneme production. The performance of the two groups on rhyme production was the worst among all tasks. The normal hearing group performed at a ceiling level on syllable counting, syllable deletion, tone detection,
judgment and repair. The hearing impaired group also performed near ceiling level on syllable counting and syllable deletion.

Figure 1. Performance of the two groups on the 10 phonological awareness tasks

**Between Group Comparison**

The two groups performed differently on the 10 phonological tasks overall. It was more interesting to evaluate the performance of the two groups in individual tasks. Therefore, planned comparison was done to compare the performance between two groups on each task.

A multivariate analysis on variance showed a significant group effect, $F_{10,19} = 2.751, p = 0.028$. Table 3 showed details of the corresponding $F$ statistics and $p$ value on the tasks.

The cochlear implant group performed significantly poorer than the hearing age-matched peers only on tone detection, judgment and repair. No significant differences were found on other phonological tasks between the two groups. Further investigation on the responses of the cochlear implant group on the three named tasks would be done.
Table 3. Statistical summary of the phonological awareness performance for the two groups

<table>
<thead>
<tr>
<th>Task</th>
<th>Mean Percentage Correct (SD)</th>
<th>Cochlear Implant</th>
<th>Normal Hearing</th>
<th>$F_{1,28}$</th>
<th>Significance $p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Syllable counting</td>
<td>90.0 (20.7)</td>
<td>94.4 (10.3)</td>
<td>0.543</td>
<td>0.467</td>
<td></td>
</tr>
<tr>
<td>2. Syllable deletion</td>
<td>85.6 (23.3)</td>
<td>95.5 (9.9)</td>
<td>2.305</td>
<td>0.140</td>
<td></td>
</tr>
<tr>
<td>3. Phoneme detection</td>
<td>46.7 (20.2)</td>
<td>54.4 (21.3)</td>
<td>1.040</td>
<td>0.317</td>
<td></td>
</tr>
<tr>
<td>4. Phoneme identification</td>
<td>62.2 (23.2)</td>
<td>73.3 (29.4)</td>
<td>1.309</td>
<td>0.262</td>
<td></td>
</tr>
<tr>
<td>5. Phoneme production</td>
<td>43.3 (29.2)</td>
<td>43.1 (21.7)</td>
<td>0.000</td>
<td>0.989</td>
<td></td>
</tr>
<tr>
<td>6. Rhyme detection</td>
<td>67.7 (23.1)</td>
<td>78.9 (19.3)</td>
<td>2.047</td>
<td>0.164</td>
<td></td>
</tr>
<tr>
<td>7. Rhyme production</td>
<td>13.3 (20.1)</td>
<td>22.3 (30.7)</td>
<td>0.903</td>
<td>0.350</td>
<td></td>
</tr>
<tr>
<td>8. Tone detection</td>
<td>74.9 (20.0)</td>
<td>98.1 (3.5)</td>
<td>19.471</td>
<td>0.000**</td>
<td></td>
</tr>
<tr>
<td>9. Judgment</td>
<td>73.3 (23.4)</td>
<td>94.4 (13.6)</td>
<td>9.116</td>
<td>0.005**</td>
<td></td>
</tr>
<tr>
<td>10. Repair</td>
<td>71.7 (20.8)</td>
<td>91.7 (20.4)</td>
<td>7.049</td>
<td>0.013*</td>
<td></td>
</tr>
</tbody>
</table>

Significant at *$p < 0.05$; **$p < 0.01$

**Within Group Comparison (Cochlear Implant Group)**

Performance in different phonological awareness tasks

Children’s performance on phonological awareness varied from task to task due to the level of phonological awareness measured and the nature of tasks. In order to compare the performance of different levels of phonological awareness, tasks with similar nature were chosen. They were tone detection, syllable deletion, phoneme detection, and rhyme detection which were also commonly used in various researches. The cochlear implant group performed best on syllable awareness, followed by tone awareness, then rhyme awareness,
and lastly phoneme awareness. The sequence was different from the control group which was tone awareness, syllable awareness, rhyme awareness, and phoneme awareness.

**Tone Detection**

Significant difference was found between the two groups on tone detection. Figure 2 showed the performance in tone detection for the cochlear implant group. The performance of the cochlear implant group for detecting the difference in tone pairs 3 and 6 was below chance level (20%), and tone pairs “2 and 4”, “2 and 5”, “2 and 6”, and “3 and 5” was slightly above the chance level (67%). The cochlear implant group showed the best performance in detecting the tone pair 3 and 4. Different tones have different fundamental frequency properties in terms of height and contour pattern. Table 4 summarized further analysis on the tone detection with reference to the properties of different tone pairs. The cochlear implant group showed the great difficulty in distinguishing the tone pairs relying on tone height distinction, especially tone pair 3 and 6.

![Figure 2. Performance in tone detection for the cochlear implant group](image-url)
Table 4. Performance in distinguishing tones according to fundamental frequency properties

<table>
<thead>
<tr>
<th>Contrast of $F_0$ Relied on</th>
<th>Corresponding Tone Pairs</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height Difference Only</td>
<td>1,3; 1,6; 2,5; 3,6</td>
<td>58%</td>
</tr>
<tr>
<td>Contour Pattern Only</td>
<td>4,5</td>
<td>73%</td>
</tr>
<tr>
<td>Both Height and Contour</td>
<td>1,2; 1,4; 1,5; 2,3; 2,4; 2,6; 3,4; 3,5; 4,6; 5,6</td>
<td>77%</td>
</tr>
</tbody>
</table>

Judgment and repair

The performance on judgment and repair revealed a significant difference between the two groups. Table 5 showed the percentage of correct response for each item in judgment and repair. The performance in judging and repairing /pin55/ (辮) for /kin55/ was the worst among the items, followed by /tʰON35/ (糖) for /pʰON35/. Only four participants with cochlear implants were able to repair the error for /pin55/ (辮). Some participants did not realize that the braids called /ma55 pin55/ (孖辮). Some only called them /ma23 mei23/ (馬尾).

Table 5. Percentage correct for items in judgment and repair of cochlear implant group

<table>
<thead>
<tr>
<th>Target Items</th>
<th>Judgment</th>
<th>Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>/tSE55/</td>
<td>umbrella</td>
<td>80.0%</td>
</tr>
<tr>
<td>/sAu25/</td>
<td>hands</td>
<td>66.7%</td>
</tr>
<tr>
<td>/wAn21/</td>
<td>cloud</td>
<td>100%</td>
</tr>
<tr>
<td>/tʰON25/</td>
<td>sweet</td>
<td>60%</td>
</tr>
<tr>
<td>/fan22/</td>
<td>rice</td>
<td>86.7%</td>
</tr>
<tr>
<td>/pins/</td>
<td>辮</td>
<td>braids</td>
</tr>
</tbody>
</table>
**Discussion**

The primary purposes of the study were to compare the phonological awareness abilities of Cantonese-speaking prelingual deaf children with cochlear implants and their hearing peers and to evaluate their phonological awareness abilities.

The present study found that the cochlear implant group and the normal hearing control group had both similarities and differences in terms of their phonological awareness abilities. The cochlear implant group generally performed poorer than the normal hearing group on all phonological tasks, except phoneme production. However, the difference of the performance in individual tasks between the two groups was only significant on tone detection, judgment, and repair. Further details of the phonological awareness abilities would be discussed with the comparison of the normal hearing group.

**Syllable awareness, phoneme awareness, and rhyme awareness**

Hearing aids users with prelingual deafness were able to develop syllable awareness which was similar to their hearing peers (Law, 1999; Sterne & Goswami, 2000). Therefore, it was not surprising that the cochlear implant group was able to show similar level of abilities on syllable awareness as normal hearing group.

On the other hand, Law (1999) found that the hearing aids users performed poorly on phoneme and rhyme awareness as compared with their hearing peers. Together with this study showing comparable performance on phoneme and rhyme awareness between cochlear
implant group and normal hearing group, it could be suggested that Cantonese-speaking
children with hearing impairment were able to develop better phonological awareness
abilities after having cochlear implantation. However, English-speaking children with
cochlear implants had poorer rhyme and phoneme awareness as their hearing peers (James et
al., 2007; Spencer & Tomblin, 2009). This might be due to the phonological nature of
English. Alphabets in English provide more phonological information than orthography in
Cantonese (Ho & Bryant, 1997). This assisted English-speaking children in developing
phonological awareness. The early development widened the discrepancy of rhyme and
phoneme awareness between children with cochlear implants and their hearing peers.
Nevertheless, the present study still suggested that Cochlear implants provided hearing-
impaired children with better speech perception (Tyler et al., 1997; Wilson et al., 1991). This
enhanced the development of phonological awareness in children with cochlear implants.

Tone Awareness

The presence of tone awareness in Cantonese highlighted the distinction for this study
over previous studies in English population. Tone awareness is unique and important for
tonal language. Tonal information contributes to the meaning and intelligibility of speech.

Results showed that cochlear implant group performed significantly poorer on tone
awareness than the normal hearing group. This was consistent with previous findings
suggesting poor tone perception abilities in prelingually hearing impaired children with
cochlear implants (Ciocca et al., 2002; Wong & Wong, 2004). In the present study, the cochlear implant group performed worst in distinguishing tone 3 and tone 6. Both tone 3 and tone 6 have the same tone contour pattern but different tone heights. Barry et al. (2002) suggested that tone height was more salient than contour pattern in the perception of tone. This might explain the particularly worse result in detecting tone pairs 3 (mid level) and 6 (low level) due to the presence of only little tone height difference between mid and mid-low. On average, the cochlear implant group performed relatively poor in distinguishing the tone pairs which relied only on height difference of the fundamental frequency.

Although the cochlear implant group was able to detect other tone pairs above chance level, they performed significantly poorer than their hearing peers as a group. However, children with cochlear implants were able to detect tones better than prelingual deaf teenagers with hearing aids (Law, 1999). This suggested that cochlear implants were able to assist tone perception better than hearing aids for children with hearing impairment but were in a limited way. Cochlear implants might not provide precise information on the height and the contour pattern of fundamental frequencies which are essential for detecting tones.

Judgment and Repair

The present study also showed significant difference on judgment and repair task between the two groups. Children had to judge the accuracy of the production of words in the judgment task. They had to perceive the word and compare the perceived word to their
internal phonological representation of the target word (Sutherland & Gillon, 2005). They had to use appropriate strategies in deleting a consonant and replacing it with a correct target consonant in the repair task (So & Dodd, 2007). Since cochlear implants improved speech perception for those with hearing difficulties (Tyler et al., 1997; Wilson et al., 1991) and the present study showed no significant difference between two groups on syllable, phoneme, and rhyme awareness, the unsatisfactory performance on judgment and repair might probably be due to the underlying phonological representations and the strategies used. The performance on judgment and repair tasks could reflect individual’s underlying phonological knowledge regardless of their awareness on speech characteristics. Although children with cochlear implants could have better auditory perception, the speech and language stimulation provided during their hearing period were certainly less than their hearing peers. Hence, the phonological knowledge of paediatric cochlear implant users might not be as well developed as their hearing peers.

Researches suggested that children with early cochlear implantation would be able to show comparable performance on their expressive language abilities and their speech production as their hearing peers in later years (Nicholas & Geers, 2007; Flipsen, 2008). Similarly, it could be hypothesized that preschool children with cochlear implants may develop better phonological knowledge with further speech and language stimulation, and continuing speech therapy. It could further be hypothesized that they might perform at
similar level as their hearing peers in the judgment and repair tasks later with the use of cochlear implants and speech therapy. This might need further investigation on school-age children with cochlear implants.

Overall, the results showed that the preschool children with cochlear implants showed the best performance in syllable awareness, followed by tone awareness, then rhyme awareness, and lastly phoneme awareness. They performed near ceiling level on syllable tasks. This suggested that the preschoolers with cochlear implants commonly had well established syllable awareness before entering primary schools. They also seemed to be acquiring tone, rhyme, and phoneme awareness in their preschool years. Results also suggested that they had some, but not well developed, phonological knowledge of Cantonese. Their performance provided ideas for the developmental sequence of phonological awareness abilities in general.

**Tone awareness abilities and dyslexia**

It was interesting that similar results on tone awareness abilities were found between children with cochlear implants and children with dyslexia (Cheung et al, 2008), as well as children who were at risks of having dyslexia (McBride-Chang et al, 2008). They all showed deficits in tone awareness. Tone awareness was also associated with Chinese reading acquisition (McBride-Chang et al, 2008; Shu, Peng, & McBride-Chang, 2008). Previous studies even suggested that the evaluation of tone awareness abilities could be parts of the
clinical tools in diagnosing risks of dyslexia for young Chinese children (Ho et al., 2000; McBride-Chang et al., 2008).

Although children with cochlear implants and children with or in risk of having dyslexia had deficits in tone awareness, they would have different underlying etiologies. The poor tone awareness of the cochlear implant group was due to their restricted hearing abilities. The use of cochlear implants did not assist the hearing impaired population much in detecting tones and developing tone awareness as suggested above. On the other hand, the deficits in tone awareness of the dyslexic children were due to the underlying phonological and reading deficits (Ho et al, 2000). Therefore, they would need different trainings focusing on their underlying deficits.

There were still no studies suggesting the relationship between the tone awareness abilities and the reading abilities in hearing-impaired population. Due to the fact that most of the children with hearing impairment had difficulties in perceiving tones as found in the present study, the deficits in tone awareness could not directly suggest them having or at risk of dyslexia. Therefore, the use of the evaluation of tone awareness abilities as parts of the clinical assessment tools in the early identification of dyslexia might not be applied on the hearing impaired population. Further investigation on the correlation of the reading abilities and the phonological awareness abilities of the hearing impaired group would be suggested.
**Limitation and Conclusion**

Since the performance of the children with cochlear implants would depend on their experience of cochlear implants, their hearing abilities before implants, trainings and speech and language stimulation provided, etc, the results of present study had large variation in individual performance. A within group comparison with represented sample size might show how the phonological awareness abilities related with different factors.

This study showed the phonological awareness abilities of preschool children as a whole in a cross-sectional study. This might only provide some general ideas on how did children with cochlear implants performed in their preschool years. The results might not reflect the exact developmental pattern of their phonological awareness abilities. A longitudinal study might be needed in order to show exactly how the phonological awareness abilities develop in children with cochlear implants.

To conclude, this study found that the Cantonese-speaking preschoolers with cochlear implants performed best on syllable awareness, less well on tone awareness, followed by rhyme awareness and performed worse on phoneme awareness. Their tone awareness abilities were restricted by the auditory perception through cochlear implants. This contributed to the only significant discrepancy in the phonological awareness on speech characteristics between the children with cochlear implants and their hearing peers. Children with cochlear implants also showed limited phonological knowledge.
Clinical Implication

The present study showed similar level of syllable, phoneme, and rhyme awareness between preschoolers with cochlear implants and their hearing peers. Therefore, we should revise our expectation towards children with cochlear implants. They have the potential to learn literacy as typical developing children. We might expect similar level of phonological awareness abilities between children with cochlear implants and their hearing peers.

The results also showed that cochlear implant group had greater difficulty in detecting tones. Although cochlear implants generally allowed better speech perception for hearing impaired population, the devices might not provide enough information in assisting the users in tones discrimination. Since tones had a significant role in tonal languages, cochlear implants’ technology should further be advanced to serve the demands of hearing-impaired population with tonal languages, e.g. Chinese. Speech therapists might also put more emphasis in improving the abilities of children with cochlear implants in distinguishing tones.

Recent researches suggested the use of tone awareness as a clinical tool in identifying Chinese preschoolers who were at high risk of having dyslexia. This might not be applicable on hearing-impaired population before further study. Future studies were urged to show the relationship between tone awareness and reading abilities in hearing-impaired population. The poor tone awareness abilities in children with dyslexia and children with hearing impairment have different underlying grounds. They would also need different trainings.
Acknowledgements

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References


Appendix A – Phonological awareness tasks

I. **Syllable Counting**

**Instruction:** Here are four pictures. Can you tell me how many cars are there in each picture? (subject’s response). Now, we are going to play a game. If one car can carry one syllable only, how many cars are needed to carry /jyn21 pAts/ (pencil)? There are two syllables in /jyn21 pAts/ (pencil), so we need two cars to carry them (point to the picture with two cars). Now it’s your turn.

呢度有四幅圖畫,你幫我數下每幅圖畫有幾多架車? (subject’s response) 我哋而家玩個遊戲,如果一架車可以載到一個字,咁幾多架車先可以載到‘鉛筆’呀? ‘鉛筆’有‘鉛’同‘筆’兩個字,所以要兩架車先至夠載。（指向兩架車那張圖畫）。而家到你試啲啦。

**Practice Trials**

1. /tAN21/ (chair) 標
2. /tsHiu55 kHAp5 si23 tshJN21/ (supermarket) 超級市場

**Test Trials**

1. /hJN55 tsiu55/ (banana) 香蕉
2. /pui55/ (cup) 杯
3. /si22 tO55 PE55 lei25/ (strawberry) 士多啤梨
4. /tsy55 ku55 lik5/ (chocolate) 朱古力
5. /pa55 si25/ (bus) 巴士
6. /mAk2 tON55 lou21/ (McDonald) 麥當勞

II. **Syllable Deletion**

**Instruction:** I would like to play a game with you. Listen carefully. What will be left if /jyn21/ is taken away from /jyn21 pAts/? I think only /pAts/ is left. How about this one, if /pAts/ is taken away from /jyn21 pAts/, what will be left? (Subject response). Right, let’s try more trials.

我同你玩個遊戲，留心聽喇，你估‘鉛筆’拎走‘鉛’剩番咩嘢呢? 我諗剩番 ‘筆’。咁如果‘鉛筆’拎走‘筆’剩番咩嘢呢? (Subject response). 唔喇，我哋不如試多幾次。

**Practice Trials**

1. /po55 pan25 tHON25/ (lollipop) 波板糖 - 糖
2. /sAi55 kw55/ (watermelon) 西瓜 - 西

**Test Trials**

1. /fO25 tsHE35/ (train) 火車 - 車
2. /hON33 pou25 pau55/ (hamburger) 漢堡包 - 漢堡
3. /tin22 wa25/ (telephone) 電話 - 電
4. /kuN55 jyn25/ (park) 公園 - 園
III. Phoneme Detection

**Instruction:** Some words start with the same sound. For example /kuN55/ and /kJk3/ have the same initial /k/ sound. But /siN55/ does not have an initial /k/ sound, so the initial sound of /siN55/ is different from /kuN55/ or /kJk3/. Now, there are another three words, you have to point to the one (picture) which does not start with the same sound.

有啲字前面嘅音係一樣嘅，好似‘公’同‘腳’前面都有個 /k/ 音。但係‘星’前面就無 /k/ 啊。所以‘星’前面嘅音就同‘公’，‘腳’前面嘅音就同‘公’，‘腳’前面嘅音唔同喇。而家我有另外三個字，你要指俾我睇（圖畫）邊個字前面嘅音唔同其他兩個字唔同。

**Practice Trials**
1. /p/ 波 /pO55/ (ball) 匹 /pui55/ (horse) 車 /tSE55/ (car)
2. /s/ 衮 /sam55/ (clothes) 狗 /kAu25/ (dog) 書 /sy55/ (book)

**Test Trials**
1. /f/ 火 /fO25/ (fire) 花 /fa55/ (flower) 龜 /kwAïs5/ (tortoise)
2. /t/ 碟 /tip25/ (plate) 梳 /sO55/ (comb) 燈 /tAN55/ (light)
3. /ts/ 豬 /tsïs5/ (pig) 遮 /tSE55/ (umbrella) 天 /tHïn55/ (sky)
4. /pH/ 盤 /pHun25/ (basin) 褲 /fu33/ (trousers) 婆 /pHO21/ (grandma)
5. /kw/ 龜 /kwAïs5/ (tortoise) 葉 /jip2/ (leaf) 骨 /kwAt5/ (bone)
6. /j/ 耳 /jï23/ (ear) 月 /jy21/ (moon) 書 /sy55/ (book)

IV. Phoneme Identification

**Instruction:** Here we have three pictures, each one make different sounds. For example, the snake makes sound like /s/. The wind makes sound like /f/. The cow makes sound like /m/. Some words start with these sounds. For example, the sound at the beginning of /si55/ (silk) is the same as the sound made by the snake. Now, it’s your turn to match the following words with the sounds made by them.

呢度有三幅圖畫，佢哋都會發出唔同嘅聲音。蛇仔嘅聲音係 /s/ 啊，風發出嘅聲音係 /f/ 啊。牛仔嘅聲音係 /m/ 啊。有啲字前面嘅音同蛇仔嘅聲音一樣嘅，好似‘絲’前面嘅音就同蛇仔嘅聲音一樣喇。而家你試下指出跟住啲字前面嘅音同邊樣嘢發出嘅聲音係一樣嘅。

**Practice Trials**
1. 媽 /ma55/ (mother)
2. 星 /siN55/ (star)
3. 花 /fa55/ (flower)

**Test Trials**
1. 水 /sJy25/ (water)
2. 襪 /mAt²/ (sock)
3. 火 /fO²/ (fire)
4. 面 /mIn²/ (face)
5. 肥 /fei¹/ (fat)
6. 手 /sAu²/ (hand)

V. **Phoneme Production**

**Instruction:** Now, we say some interesting sounds. Let’s say /h/ together. I can make a word start with this sound ‘h - /ha55/’ (shrimp). Now, see if you can try other sounds and make more words for me.

我哋而家講一啲好得意嘅音。我哋一齊講/h/。我可以用呢個音做啲字出嚟，好似 ‘h - 蝦’ 咁。不如而家你試吓將其他啲音再做多啲字出嚟啦。

**Practice Trials**

1. /w/
2. /p/

**Test Trials**

1. /s/
2. /tSh/
3. /l/
4. /f/
5. /m/
6. /kH/

VI. **Rhyme Detection**

**Instruction:** Let’s listen to three words: /pou55/, /tou55/, /sO55/. There is a sound /ou55/ at the end of /pou55/. This sound also presents at the end of /tou55/. Both words have the same sound at the end. However, the word /sO55/ does not have the sound /ou55/ at its end. So it does not have the same sound at the end as /pou55/ and /tou55/. Now, you have to point to the picture which sounds similar to ___ (point to the target picture).

我哋而家聽下三個字，‘煲’、‘刀’、‘梳’。‘煲’後面有 /ou55/ 咁嘅音，‘刀’後面都有 /ou55/ 咁嘅音。但係‘星’後面就沒有 /ou55/ 呢個音喇。所以‘星’後面嘅音係同‘煲’、‘刀’唔同嘅。呢度有四幅圖畫，而家你指俾我睇邊個字後面嘅音係同_____一樣嘅 (point to the target picture).

**Practice Trials**

<table>
<thead>
<tr>
<th>Target</th>
<th>Rhyme Choice Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>車 /tsHE55/ (car)</td>
<td>梳 /sO55/ (comb)  隔 /tsE55/ (umbrella) 一 /jAt5/ (one)</td>
</tr>
<tr>
<td>水 /sJy25/ (water)</td>
<td>咀 /tsJy25/ (mouth)  狗 /kA25/ (dog)  鼓 /ku25/ (drum)</td>
</tr>
</tbody>
</table>

**Test Trials**

1. □ /hA25/ (mouth)  雲 /wAn21/ (cloud)  魚 /Jy25/ (fish)  手
VII. Rhyme Production

**Instruction:** You say /fə55/ (flower) (Subject’s attempt). Now we try to find some words that end with the same sound as /fə55/. For example, /kə55/ and /fə55/ end with the same sound /ə55/. Now, it’s your turn, can you find some words that end with the same sound as the following words?

你講‘花’，而家我哋試下揀啲字同花個尾音係一樣嘅，即係/aə55/，例如‘家’同‘花’個尾音都係/aə55/。所以就一樣喇。而家不如你試下揀啲字同‘梳’嘅尾音係同音嘅。

**Practice Trials**
1. 梳 /sO55/ (comb)
2. 豆 /tAu25/ (bean)

**Test Trials**
1. 雞 /kAi55/ (chicken)
2. 葉 /jip2/ (leaf)
3. 遮 /tsE55/ (umbrella)
4. 貪 /tHam55/ (greedy)
5. 水 /sJy25/ (water)
6. 一 /jAt5/ (one)
VIII. Tone Detection

**Instruction:** Now, we listen to two words, /ma55/, /ma33/, the tone of /ma55/ is higher than that of /ma33/, so they are not the same. Now we try another two words /tO55/, /tO44/. Are they the same? (Subject’s attempt) Right, they are the same. Let’s try more trials.

而家我哋聽下兩個字，‘媽’‘嗎’。‘媽’係高音過‘嗎’嘅，所以佢哋係唔一樣嘅。而家試下另外兩個字‘多’‘多’，佢哋係咪一樣呀？(Subject’s attempt) 唔喇，佢哋一樣嘅。而家不如你試多啲字啦。

**Practice Trials**

<p>| | | | | |</p>
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<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>詩</td>
<td>/si55/</td>
<td>(poem)</td>
<td>詩</td>
</tr>
<tr>
<td>2.</td>
<td>張</td>
<td>/tsJN55/</td>
<td>(Cheung)</td>
<td>獎</td>
</tr>
</tbody>
</table>

**Test Trials**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>日</td>
<td>/jAt22/</td>
<td>(sun)</td>
<td>日</td>
</tr>
<tr>
<td>2.</td>
<td>眼</td>
<td>/jiu22/</td>
<td>(light)</td>
<td>要</td>
</tr>
<tr>
<td>3.</td>
<td>開</td>
<td>/hOi55/</td>
<td>(open)</td>
<td>害</td>
</tr>
<tr>
<td>4.</td>
<td>誕</td>
<td>/tan33/</td>
<td>(born)</td>
<td>單</td>
</tr>
<tr>
<td>5.</td>
<td>唱</td>
<td>/tsHJN33/</td>
<td>(sing)</td>
<td>場</td>
</tr>
<tr>
<td>6.</td>
<td>畸</td>
<td>/kHei55/</td>
<td>(abnormal)</td>
<td>奇</td>
</tr>
<tr>
<td>7.</td>
<td>泥</td>
<td>/lAi21/</td>
<td>(mud)</td>
<td>泥</td>
</tr>
<tr>
<td>8.</td>
<td>飯</td>
<td>/fan22/</td>
<td>(rice)</td>
<td>帆</td>
</tr>
<tr>
<td>9.</td>
<td>病</td>
<td>/pEN22/</td>
<td>(sick)</td>
<td>餅</td>
</tr>
<tr>
<td>10.</td>
<td>水</td>
<td>/sJy25/</td>
<td>(water)</td>
<td>碎</td>
</tr>
<tr>
<td>11.</td>
<td>周</td>
<td>/tsAu55/</td>
<td>(Chau)</td>
<td>酒</td>
</tr>
<tr>
<td>12.</td>
<td>淡</td>
<td>/tHam23/</td>
<td>(tasteless)</td>
<td>貪</td>
</tr>
<tr>
<td>13.</td>
<td>厚</td>
<td>/hAu32/</td>
<td>(thick)</td>
<td>後</td>
</tr>
<tr>
<td>14.</td>
<td>褲</td>
<td>/fu33/</td>
<td>(trousers)</td>
<td>婦</td>
</tr>
<tr>
<td>15.</td>
<td>檯</td>
<td>/tHOi35/</td>
<td>(table)</td>
<td>抬</td>
</tr>
<tr>
<td>16.</td>
<td>妃</td>
<td>/lei21/</td>
<td>(girl)</td>
<td>你</td>
</tr>
<tr>
<td>17.</td>
<td>使</td>
<td>/si25/</td>
<td>(make)</td>
<td>試</td>
</tr>
<tr>
<td>18.</td>
<td>免</td>
<td>/min23/</td>
<td>(free)</td>
<td>免</td>
</tr>
</tbody>
</table>
IX. **Judgment and X. Repair**

**Instruction:** I am going to show you some pictures. I want you to listen carefully.

Listen /tOi35 sJN22 min22 jAu23 tsi55 jAt55/. Is it silly? I should say /tOi35 sJN22 min22 jAu23 tsi55 pAt55/ but I said /jAu23 tsi55 jAt55/, say /jAt55/ instead of /pAt55/ (pen). Now, listen carefully. Tell me if I say something silly and funny, if ‘yes’, help me to fix it.

我而家會俾啲圖畫你睇。你要留心聽住喎。檯上面有支/jAt55/（筆）。係咪怪怪哋呢？我應該講檯上面有支筆，但係我講咗有支/jAt55/將‘筆’講成/jAt55/。而家不如你試吓聽住我有沒有講啲怪怪地嘅，好笑嘅嘢，如果有，幫我改番啱佢。

**Procedure:**

Say the stimulus, then ask 1. 有沒有怪怪哋 (Did I say something silly?)

if say yes 2. 你幫我改番啱佢啦 (Help me to fix it.)

**Practice Trials**

1. 電視機入面有米奇老鼠 lou23 sy25/ (There is a Mickey mouse in the television.)

2. 煙通出好多/sin55/ target: 煙 /jin55/ (There is much smoke come out of the chimney.)

**Test Trials**

1. 落雨要擔 /tE55/ target: 遮 /tsE55/ (When it is raining, must take an umbrella.)

2. 熊人係度洗 /tsAu55/ target: 手 /sAu25/ (Bear is washing hands.)

3. 天空有白雲 /tHin55 huN55 jAu23 pak22 wAn21/ (There is cloud in the sky.)

4. 手上面有粒 /pHON25/ target: 糖 /tHON55/ (There is sweet on the hand.)

5. 個碗裝住啲飯 /kO33 wun25 tsON55 tsy22 ti55 fan22/ (There is rice in the bowl.)

6. 個女仔紮住孖 /kin55/ target: 辮 /pin55/ (The girl is tying two braids.)
Appendix B – Letter for recruiting participants

(Date)

Dear Principal,

Asking for assistance in recruiting participants for research

I am a year four student in the Department of Speech and Hearing Sciences of the University of Hong Kong. I am writing to ask for your assistance in recruiting participants for my final year research.

My study aims at evaluating the phonological awareness skills of hearing-impaired children with cochlear implants in order to provide some elementary information and support for the speech therapists on their intervention of the hearing-impaired students and to make appropriate assumption about their phonological awareness. I would like to make a comparison on the phonological awareness abilities of the children with cochlear implants and their matched age peers with normal hearing.

In order to pursue my study, I am now looking for 15 native Cantonese-speaking children aged from 3;0 to 6;0 with prelingual profound hearing impairment and fitted with cochlear implants for at least one-year. They should have normal intelligence with no known visual, emotional, behavioral, physical, cognitive, and neurologic impairments.

The subjects will be required to attend a 30 to 40-minute session individually in quiet room in the school. Each subject will be asked to perform ten phonological tasks. Audio-recording will be made during the sessions. The time and the date of the session are negotiable. All information will be kept confidential and in no way the students will be identifiable from the results recorded.

For further details of my research or reply, please feel free to contact me via (phone) (Tse Wing Ting). Thank you for your attention and assistance. I am looking forward to hearing from you soon.

Enclosed includes a consent form for my research in which you are free to distribute it to the possible candidates.

Yours sincerely,

Tse Wing Ting
Speech and Hearing Sciences
The University of Hong Kong
父母/監護人同意書

敬啓者：

本人是香港大學言語及聽覺科學系四年級學生，將進行一項關於弱聽兒童的學術研究，對象為三至六歲的兒童。研究旨在探討弱聽兒童的廣東話音韻意識。是項研究將有助言語治療師理解學生在這方面的發展，以協助釐定合適的言語治療課程。

參與此研究的同學只需按老師的安排，在課堂中參予一節約四十分鐘的評估。請閣下填妥以下回條，以表示閣下是否同意貴子弟參與是項研究。為了把所得資料作詳細分析，評估過程將會被錄音，參與純屬自願性質，所收集的資料只作研究用途。希望閣下能對此研究給予支持，讓貴子弟參與其中。如閣下對是項研究有任何查詢，請與謝穎婷聯絡(phone)。如閣下想知道更多有關研究參與者的權益，請聯絡香港大學非臨床研究操守委員會(2241-5267)。

此致
貴家長

香港大學言語及聽覺科學系四年級學生

謝穎婷謹啟

二零零八年十月三十日

-------------------------------------------------------------------------------

家長回條

學生姓名：________________ 班別：_______ 學號：______

本人 ** 同意 / 不同意 子弟參與是項研究。
(**請刪去不適用者)

家長姓名：_________________

家長簽署：_________________

日期：__________________
Dear Parents,

I am Tse Wing Ting, Division of Speech and Hearing Sciences at the University of Hong Kong. I will conduct a research project on the Phonological Awareness of Cantonese-Speaking Children with Cochlear Implants and would like to invite children aged three to six to participate. The project will contribute to the understanding of children’s phonological awareness abilities; and will help planning for future speech therapy training.

Students who participate in this research will complete a 40-minutes assessment session arranged by the school’s teacher. Please complete the reply slip below to indicate whether you would allow your child to participate in this research soon. To allow a detailed analysis, the session will be audio-recorded. Participation is entirely voluntary, and all information obtained will be used for research purposes only. If you have any questions about the research, please feel free to contact Tse Wing Ting (phone). If you want to know more about the rights as a research participant, please contact the Human Research Ethics Committee for Non-Clinical Faculties, the University of Hong Kong (2241-5267).

Your help is very much appreciated.

Yours sincerely,

Tse Wing Ting
Division of Speech and Hearing Sciences
The University of Hong Kong

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Reply Slip

Student Name: ___________  Class: _____  Class No.:__________

I ** will / will not give permission for my child to participate in the research.  
(** Please delete if inappropriate.)

Parent Name: ________________________________

Parent Signature: ____________________________

Date: ______________________________________