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Early strengthening of phonological awareness supports the process of learning to read

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Abstract

Although the role of phonological awareness in early reading has been well reported, its relationship, for instance, to the effects of language-specific factors on the process of learning to read has yet to be examined. In this study, a group of pre-school children were assessed via a wide battery of phonological awareness tasks, which emphasize the language-related features of Finnish. The contribution of phonological awareness to the development of reading decoding and the writing of multisyllabic words has been assessed by the follow-up from the 1st to the 3rd grade in school. The recent research has provided an analysis of the ways in which pre-school children, especially at-risk children, process the linguistic information. In addition, the results indicate the importance of both phonological awareness and phonological representations in literacy, also in the cross-linguistic context. Furthermore, certain inclusive methods for strengthening phonological awareness are described and discussed in relation to the Vygotskian conception of scaffolding the individual and joint reasoning.

Introduction

One third of Finnish children acquire reading skills spontaneously at the age of 6 or 7, although no formal instruction is given in pre-school education. This is apparently due to the high orthographic transparency of the Finnish language and the parents’ and educators’ inclination to support children in becoming familiar with written language. Still, a number of children face barriers to literacy development. It is important to assist these children in acquiring the necessary reading skills as well as to try to prevent the emergence of secondary problems, e.g., avoidance strategies in challenging learning situations resulting from failure in early reading.

Although follow-up studies have been used to identify factors that help predict the process of learning to read (e.g. Scarborough 1998; Silven 2002), the signs indicating reading difficulties are hard to detect in routine pedagogic activities. In this paper, I provide an overview of this research and its findings. The core objective of the study was to identify signs of reading difficulties. The views of psycholinguistic research on the significance of phonological awareness as the groundwork for the ability to read
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constituted the starting point of the research. Furthermore, an additional goal was to produce practices to improve the facilities for reading at the pre-school level, before formal reading lessons begin in primary school. This research is inspired by Vygotsky’s ideas, and motivated by practical educational concerns. Before describing the research itself, I will explain how it has been shaped by both phonological and socio-cultural theories and shared educational concerns.

**Phonological approach**

Many studies have made it clear that phonological awareness plays an important role in the acquisition of initial reading skills. It reflects the strength of a child’s ability to represent linguistic information cognitively at the phonological level. It develops gradually from the tacit (epiphonological) to the explicit (metaphonological) level (Karmiloff-Smith, 1986; Gombert 1992; Stackhouse 1997). Analysis at the tacit level includes e.g. rhyming and syllable counting. Thus, most young children demonstrate rhyming skills and syllable segmentation even without alphabetic or orthographic knowledge. Phonological manipulation tasks reflect explicit levels of analysis (Gombert 1992; Hester & Hodson 2004). Stackhouse (1997) proposes that associated feedback at the tacit level of phonological awareness is primarily auditory, whereas at the explicit level of awareness it is both articulatory and orthographic. Therefore, to be a successful decoder, the child must have adequate orthographic experience to approach the explicit level of phonological awareness.

By reading, phonological and associated orthographic representations become firmly established. Most of the data on the development of phonological awareness has typically focused on children who are taught the alphabetic principle, and on the development of early literacy skills. Less is documented about phonological representations of children at that age. Mental representations at the phonological level comprise codes for individual sounds of language and rules for ordering and combining them (Wolf et al., 1998). These codes and rules appear to develop gradually. The child overcomes the phonological processes that simplify the phonological representations during the linguistic development. The term ‘phonological processes’ is used by linguists (e.g. Ingram 1989; Magnusson 1983) to describe mental operations performed on behalf of the physical systems involved in speech perception and production.
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Thus, along a continuum of the linguistic development to early literacy, the child not only learns to segment the continuous stream of speech, distinguish the syllable boundaries, and break syllables into phonemes, but also to associate these with shifting contexts to assign the meaning of the word. The final level of phonological analysis includes the identification, isolation, blending, and manipulation of individual syllables and phonemes that form words. These tasks target a segmental level of phonological representation (Mäkinen 2002; Hester & Hodson 2004). In addition, the child must solve the problem with the connections between sound and print by acquiring an awareness of the phonological and orthographic features of the words.

Children become formally acquainted with the alphabetic principle, the concept that the letters of the alphabet stand for speech segments, at the beginning of formal reading instruction (in the 1st grade of school in Finland aged 7). During the first semester of the first grade the children are taught most of the letter sounds, and they practice phonological assembly with familiar letters from the very beginning of reading instruction. The single letters map onto phonemes in a regular manner because of the regular and purely phonemic orthography of the Finnish language. In addition, the syllables are fairly short and consonant clusters are relatively rare in Finnish.

Despite the transparent alphabetic orthography, there are a number of children who have problems with the acquisition of literacy skills. This could mean that in spite of regular grapheme-phoneme correspondence, reading decoding requires robust phonological representations (Stackhouse, 1997; Hester & Hodson, 2004). Significantly, words in Finnish are relatively multisyllabic and may take different orthographic forms depending on the derivational or inflectional suffixes, because of the agglutinative morphological system. Furthermore, the variation of phonemic duration is semantically very distinctive.

**Sociocultural perspective**

There is no consistent and unified socio-cultural approach to the research on initial reading, especially with at-risk children and education. However, some researchers treat education and cognitive development as cultural processes. Thereby learning is not only possessed individually but also shared amongst peers in the classroom. These approaches are built on the work of Vygotsky. According to him, language and social
interaction are involved in the process of human development and learning (Vygotsky, 1978a; 1978b; 1986). Children construct their understandings jointly, through their involvement in learning activities. These approaches share the view that we cannot understand the nature of thinking or learning without taking the intrinsically social and communicative nature of development into account (e.g. Cobb, 1999; Light & Littleton, 1999). Vygotsky (1978; 1986) has proposed that there is a close relationship between inter-mental and intra-mental cognitive capabilities, with children’s involvement in joint activities generating new ways of thinking. Even though only a few results have supported this claim (Wood, 1999; Rojas-Drummond & Mercer, 2003), many researchers have accepted it.

Method

Participants. The study was carried out as a training and follow-up research, which has taken four years from pre-school until the end of the third grade. The sample included a training group (N=16), a control group (N=15) and a follow-up group (N=37) from three sparsely populated rural communities in Finland. Finnish was the primary language spoken in the homes of all the children participating in the study. At the initial test the children’s ages ranged from 5:9 to 6:2. In addition, two pre-school teachers and six elementary school teachers participated in the planning, reflection and observation activities throughout the study.

Materials and procedures. The research material consisted of initial, final and literacy tests, and also of the documentary material provided by the children and the teachers. The 50 lessons were tape-recorded during the training programme, which lasted for the pre-school year. Documentary material created by the children and reflection and observation diaries of the teachers were also utilised in the study. All children were tested at the beginning of pre-school education and the final test was held at the end of the pre-school year. In addition, four reading and writing assessments were administered during the first three grades of primary school.

Phonological awareness test. To assess phonological awareness, twelve non-standardised tasks were administered. There were 10 words in each task. The tasks that were used in measuring tacit (epiphonological) awareness were rhyme choice (each string containing three words, phonetically confusable items), rhyme supply, word
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segmentation of sentences, length-of-word comparison, first sound comparison, and syllable counting.

Two tasks were used to assess the children’s explicit (metaphonological) level of phonological knowledge: syllabic addition and deletion tasks. In these tasks the children were asked to add or delete the initial or final syllable of the target and to pronounce the new word that was formed or the remaining part of the word (which sounded like a real word). Between the epiphonological and metaphonological tasks, four other tasks requiring working with multisyllabic words were administered. These included blending phonemes into words, isolating the initial phoneme of the word, isolating the initial syllable of the word, and segmenting words into syllables.

Initial literacy test. To assess early literacy skills, eleven non-standardised tasks were administered: comparing phonemic duration, writing the initial/middle/final letter of the word, writing the initial syllable of the word, writing the rest of the word (the first syllable given), writing the orally presented syllable (cv, cvc, cvvc, cvcc), writing the multisyllabic words, reading the word and determining the syllable boundaries, and reading and linking together the written word/sentence and the picture.

Literacy development tests. To assess the process of literacy skills acquisition, tasks on reading and writing multisyllabic words were incorporated into the standardized screening tests performed by part-time special needs teachers during the first three grades of school.

Results
An approach combining the quantitative and qualitative samples was used in the research. Analysis of variance (ANOVA) was the primary tool for data analysis to examine the performance of the pupils. Each response to the tests was scored as entirely correct (1 point) or incorrect (0 points), (max 10 point in each task). In the qualitative analysis of the phonological awareness tests the expressions of the pre-schoolers were categorised on the basis of the phonological structure of Finnish. The development of phonological awareness into incipient literacy was described by the qualitative comparison of pairs. The pedagogical guidelines were shaped by an analysis of the contents of the teachers’ texts and by changes in the contents during the training programme.
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**Performance of the pre-school children in the initial test**

The distribution for the performance of the children in terms of percentage is shown in Figure 1. There was no statistically significant difference between the performance of the training and the control groups (F = 1.0, p = .32, df 30) at the starting point of the programme. The performance of the children was classified into four categories, which I named: the dozers, who completed less than 32.5%; the workers, who achieved less than 50%; the solvers, who performed 50 – 66.9%; and the readers, who were able to cover over 67% of the total score. The dozers were identified as children at risk for literacy problems.

**Figure 1.** Performance of the children (N=68) at the task levels in terms of percentage

![Bar chart showing performance of children at different levels](image)

The primary focus was on the dozers’ performance. As Figure 1 shows, they performed best on the epiphonological (Gombert, 1992) level (M = 4.85, sd = 0.49), which reflected tacit ability to perceive and represent phonological information. The tasks on the level named “pre-metaphonological” seemed to require mature syllable and phoneme identification skills to perform properly. Most of the dozers had comparatively severe difficulties in the tasks demanding synthesis of phonemes (M = 2.71, sd = 1.7), isolation of the initial phoneme (M = 1.33 sd = 1.93) of the word, and syllabic segmentation (M = 2.29, sd = 1.05). They had even more problems with the tasks concerning syllabic manipulation. In these tasks the children were required to change the meaning of the word by adding a syllable (M = 2.33, sd = 2.03) or deleting a syllable (M = 1.19, sd = 1.69).

Difficulties with the tasks concerning syllabic segmentation and manipulation took various forms and depended on the structure of the stimulus word. E.g., segmenting the
monosyllabic word slowly and explicitly into syllables triggered phonological processes (e.g. Ingram, 1976; Magnusson, 1983; Iivonen, 1994). There was a tendency to multiple processes (e.g. syllable deletion/reduction/insertion) as the stimulus words became more complex. This implies that the key problems lie on the suprasegmental rather than on the phonemic level. This may also indicate weaknesses in the phonological representations (Stackhouse, 1997; Hester & Hodson, 2004). This is a noteworthy observation given the multisyllabic nature of the Finnish language. Therefore, in order to become a successful decoder, a child must attain firmly established phonological and associated orthographic representations.

**Method for strengthening phonological skills**

The main goal of the training programme was to arrange opportunities, especially for the dozers (as explained previously), for playing extensively and systematically with language (Dryden & Vos, 1997). Next I will proceed to describe how the inclusive methods were shaped to improve phonological skills (e.g. Phillips, 2004). This research, as previously mentioned, is based on the Vygotskian socio-cultural conception (see also Cobb, 1999; Light & Littleton, 1999; Rojas-Drummond & Mercer, 2003), which focuses on the ways of understanding and improving the quality of teacher-led dialogue, scaffolding, and peer group activity whilst practising phonological awareness. This has led to the following guidelines for the development of the program:

1. **Heighten the children’s phonological awareness:**
   - pay attention to both the phonemic structure and meaning of a word
   - emphasise the heightening of an explicit awareness on a syllabic level
   - demonstrate the phonological tasks by using tangible and visual supports
   - initiate the children into recognising both the orthographic and the phonological features of a word
   - strengthen the recognition of grapheme-phoneme correspondence

2. **Confirm the experience of equal participation for all the children involved:**
   - provide the same activities for all the children to participate in, and include the differentiation of tasks by giving more or less challenging word structures to work with
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- highlight that actions, thoughts and emotions contribute to learning
- develop instructional tools to help arouse the children’s interest in phonological awareness activities:
  - associate exercises with contexts that are familiar and interesting for the children
  - use mental and functional images to support oral language games
  - scaffold the learning processes by modelling and verbalising the paths of performance and thought
  - encourage learning through positive experience

**Performance of the pre-school children in the final test**

Analysis of the variance (ANOVA) indicated that the programme led the training group to improve their phonological awareness. The performance of the training group indicated a significant achievement in every task-level (scored 0–10), as shown in Table 1.

**Table 1.** Performance of the training (N= 16) and the control (N=15) groups in the final test

<table>
<thead>
<tr>
<th>The level of the task</th>
<th>Training group</th>
<th>Control group</th>
<th>DF</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Epiphonological</td>
<td>9.2</td>
<td>0.5</td>
<td>7.6</td>
<td>1.5</td>
<td>29</td>
</tr>
<tr>
<td>Premetaphonological</td>
<td>7.7</td>
<td>1.3</td>
<td>5.1</td>
<td>1.7</td>
<td>29</td>
</tr>
<tr>
<td>Metaphonological</td>
<td>6.9</td>
<td>2.6</td>
<td>3.3</td>
<td>2.9</td>
<td>29</td>
</tr>
</tbody>
</table>

Significance: * = p ≤ 0.05, ** = p ≤ 0.01, *** = p ≤ 0.001, n.s. = not significant

**Performance of the children in reading and writing decoding in the 1st grade**

The most distinct tasks in predicting reading decoding were the pre-metaphonological tasks. The children in the training group performed in a significantly proficient manner in the tasks, where they were told to write the orally presented syllable, the initial syllable of the word, and the rest of the word when the initial syllable was given (Table 2). These tasks required the perception and awareness of the word structure on a syllabic level.
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Table 2. Dozers at the reading and writing test in the 1st grade (at age 7)

<table>
<thead>
<tr>
<th>The tasks of reading and writing</th>
<th>Training group</th>
<th>Control group</th>
<th>DF</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Reading and linking together the written word and the picture</td>
<td>9.6</td>
<td>0.9</td>
<td>4.4</td>
<td>4.3</td>
<td>10</td>
</tr>
<tr>
<td>Reading and linking together the written sentence and the picture</td>
<td>9.6</td>
<td>0.9</td>
<td>2.8</td>
<td>4.4</td>
<td>10</td>
</tr>
<tr>
<td>Writing the orally presented syllable</td>
<td>8.3</td>
<td>1.2</td>
<td>2.1</td>
<td>3.6</td>
<td>10</td>
</tr>
<tr>
<td>Writing the initial syllable of the word</td>
<td>9.0</td>
<td>1.2</td>
<td>2.8</td>
<td>4.1</td>
<td>10</td>
</tr>
<tr>
<td>Writing the rest of the word</td>
<td>8.8</td>
<td>1.1</td>
<td>1.8</td>
<td>3.5</td>
<td>10</td>
</tr>
</tbody>
</table>

Significance: * = p ≤ .05, ** = p ≤ .01, *** = p ≤ .001, n.s. = not significant

The qualitative analysis of the texts written by the teachers supports the quantitative findings above. The skills involved in the successful phonological awareness development referred to the speech and cognitive processing as well as the attention and the knowledge of metacognitive strategies, which helped the children to carry out the tasks.

The recent follow-up study has progressed up to the 3rd grade of school (aged 10). Table 3 shows that the performances of the training and control groups differed significantly in writing skills during the first three grades of school, while the reading decoding measure demonstrated no significance. On the other hand, writing and reading skills were assessed by the screening tests, where scores under 6 (on a scale 4–10) entitled the child to receive coaching offered by part-time special needs teachers. None of the training group children scored under the limit; some of the control group did.

Table 3. The dozers reading and writing performance during the first three grades of school

<table>
<thead>
<tr>
<th>Reading and writing tasks</th>
<th>Training group</th>
<th>Control group</th>
<th>DF</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>1st grade: writing</td>
<td>7.6</td>
<td>1.6</td>
<td>4.5</td>
<td>1.1</td>
<td>10</td>
</tr>
<tr>
<td>2nd grade: writing</td>
<td>8.2</td>
<td>1.2</td>
<td>5.6</td>
<td>1.3</td>
<td>10</td>
</tr>
<tr>
<td>2nd grade: reading</td>
<td>8.2</td>
<td>1.5</td>
<td>6.6</td>
<td>1.5</td>
<td>10</td>
</tr>
<tr>
<td>3rd grade: writing</td>
<td>8.2</td>
<td>1.6</td>
<td>5.5</td>
<td>1.6</td>
<td>10</td>
</tr>
</tbody>
</table>

Significance: * = p ≤ .05, ** = p ≤ .01, *** = p ≤ .001, n.s. = not significant
Discussion

The development of phonological awareness into early reading and writing decoding was described as a transition from the stage of sensitisation (epiphonological) to the stage of explicit skills (metaphonological). Between these two stages lies the stage where the identification of the segments of words (pre-metaphonological) creates a bottleneck for the development of reading skills. The pre-metaphonological exercises emphasised the child’s abilities in syllable and phoneme analysis and synthesis. The features of the phonological awareness of the pre-schoolers and the development of those features formed the general lines of development and individual paths towards initiating the ability to read and write.

According to the results, the children’s cognitive and phonological processing skills had a significant effect on the development of phonological awareness. Phonological awareness also demanded controlled thinking and concentration of the child. The results also support the predictions that learning to read requires the ability to link phonological and orthographic representations. This indicates the crucial role of robust phonological representations in successful reading decoding (e.g. Goswami, 1997; Stackhouse, 1997; Hester & Hodson, 2004). It is important to note, because of the multisyllabic words, that Finnish is a syllable-timed language. This plays a central role in the reading decoding process.

The results predict that the collaborative pre-school training of phonological awareness and meta-cognitive skills contributes to the process of learning to read and write. The best support for decoding was given by exercises that emphasised the skills in recognising the linearity and the rhythm of words. Thus, the training intervention included exercises in identifying, naming and manipulating syllables and phonemes. In addition, the children were introduced to the orthographic dimension of words by including written words, syllables and letters.

During the pre-school year, the training of phonological awareness developed into a teaching method that linked sociocultural theory and educational practices. The pedagogical keys were named action, emotion and thought keys. On the theoretical side, the research supports Vygotsky’s (1978; 1978b; 1986) proposal about the influence of inter-mental activity on intra-mental development. The scaffolding interaction enables
collective thinking and promotes the development of individual reasoning and the advancement of phonological awareness and literacy.

The research has also provided insights into the teaching and learning process (e.g. Cobb, 1999; Rojas-Drummond & Mercer, 2003). During the research process, the teachers’ ways of supporting the learning process became more pedagogically aware. For instance, the emphasis on the correct answer (Wood, 1999) and easy success were changed into didactic sensitivity to identify, guide and encourage children in making their thoughts and reasons explicit, and to aim at the development of phonological awareness towards literacy.

The elements of a successful training lesson consisted of educational tools that helped improve attentiveness and challenge thinking, as well as arouse interest and bring the joy of success (e.g. Dryden & Vos, 1997). The pedagogical methods of the programme consisted of mental and functional images, as well as teaching dialogue. The images attracted attention towards the tasks. The teacher-led dialogue supported the development of thinking and meta-cognition. The findings support the view (Rojas-Drummond & Mercer, 2003) that children benefit from activities in which there is a careful integration of teacher-led discourse and peer group interaction. Learning is an interaction process, in which the contexts of the peer group and the learning situations are central.
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