

Phonological awareness and word reading in a transparent orthography: Preliminary findings on Indonesian.

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Abstract

This paper reports the initial findings from a longitudinal study on the phonological awareness skills and word reading abilities of 73 Indonesian children from Grade 1. Children were tested on syllable detection, syllable deletion, onset detection, rhyme detection, phoneme deletion, letter identification, word reading and non-word reading. Results are discussed in relation to the characteristics of the spoken language and its orthography.

1. Introduction

There has been considerable interest in the connection between speech and reading. Research has indicated that phonological awareness, the child's awareness that spoken words can be broken down or manipulated into smaller units of sound, is one of the critical skills in the acquisition of reading in an alphabetic orthography (Bradley & Bryant, 1983; Stanovich, Cunningham & Cramer, 1984; Tunmer & Nesdale, 1985). Children who are having difficulties in learning how to read and write often have difficulties in phonological awareness tasks (Hansen & Bowey, 1994; Snowling, Goulandris, Bowlby & Howell, 1986). Phonological awareness can be assessed by testing children's ability to perform mental manipulations on speech segments, for example by tapping out the number of syllables in a word, deleting the onset or initial sound of a word, or detecting similarities between words (McBride Chang, 1995).

The development of phonological awareness appears to progress from more global phonological characteristics of words to representing smaller segments, i.e. from the syllable level to the onset-rime level to the phonemic level (Goswami, 1999; Goswami, 2000; Goswami & Bryant, 1990; Metsala & Walley 1998). Syllabic awareness refers to the ability to be able to segment words into syllables, e.g. *wagon* into *wa-gon*. Onset-rime awareness is the ability to detect that a syllable is made up of the onset, which corresponds to any phonemes before the vowel, and the rime, which refers to the vowel sound and any following phonemes, e.g. *pat* consists of two components *p* and *at* (Goswami, 1999). Phoneme awareness refers to an awareness of the smallest, meaningful sounds that make up a word, for example that the word *pat* is made up of three phonemes, i.e. *p-a-t*. An awareness of syllables, onsets and rimes appears to develop in preschoolers, whereas phoneme awareness develops in conjunction with learning to read an alphabetic orthography, as grapheme information helps with this process. Studies across many different languages have found robust correlations

between children's performance on phonemic awareness tasks and their knowledge of the letters of the alphabet, and success in learning to read and spell (Goswami, 2000).

Languages differ in the complexity of their orthographies and how they represent spoken language. It is possible to classify alphabetic orthographies along a continuum according to the transparency or regularity of their letter-sound (grapheme-phoneme) correspondences. English has an exceptionally irregular orthography, whereas Indonesian is a remarkably transparent language, i.e. it has almost one to one correspondence between graphemes and phonemes, which should make Indonesian script one of the easiest scripts to learn to read and write. The present study aims to investigate the connection between phonological awareness and reading in an extremely transparent language, Indonesian. There have been relatively few studies which have investigated the acquisition of phonological awareness skills in languages unrelated to English, and how development is affected by the characteristics of the spoken language and its orthography (Goswami, 1999).

Recent research indicates that the level of phonological awareness that is most predictive of reading development depends on the characteristics of the particular language and orthographic system being learnt (Durgunoğlu & Öney, 1999). In English there is a strong connection between rhyming ability and early reading (Bradley & Bryant, 1983; Bryant, MacLean, Bradley & Crossland, 1990). It has been speculated that the reason for this is that there is a relatively high degree of spelling-sound consistency at the level of the rime compared to the level of the vowel phoneme. However, this has not been observed in more orthographically transparent languages (Goswami, 1999, 2000; Wimmer & Goswami, 1994). Rime awareness has also been found to be easier in English than onset awareness (Bradley & Bryant, 1983). In addition, Caravalos and

Bruck (1993) found in English and Czech children that onset awareness was easier than phoneme awareness.

Turkish has very clear syllable boundaries and words are very easy to break into syllables. In concordance with this orthographic characteristic, Durgunoğlu & Öney (1999) found that Turkish children manipulated syllables more accurately than English children. As Indonesian is predominantly composed of bisyllabic or multisyllabic words with four or more syllables, it is also expected that the syllable will be a more salient unit for Indonesian beginning readers than the rime. In multisyllabic words the unit rime corresponds to a segment larger than a syllable (Cardoso-Martins, 1995). In beginner Indonesian reading books in contrast to English, there are only a small number of words which are mono-syllabic, instead there is a preponderance of di- and multisyllabic words. Hence, it is expected that sensitivity to the syllable will play an important role in the acquisition of reading and spelling in Indonesian, as it is multisyllabic and has a relatively simple syllabic structure.

Reading errors when reading words and non-words can give us clues about the strategies that children use when initially learning how to read in different orthographies. Pseudoword or non-word reading is particularly useful as it assesses the child's phonological decoding skills and ability to map phonemes onto graphemes. Stuart and Coltheart (1988) found that reading errors made by English beginning readers involved reading one word for another, which gives evidence for the use of a lexical-logographic (whole-word) reading strategy. In German, a relatively transparent language, children's errors in word reading are mostly non-words which indicate that German beginning readers use the sublexical route using grapheme-phoneme correspondences. In addition, it has been found that German children use a similar sublexical approach in reading familiar and non-words, whereas English children appear to use different strategies, i.e. a lexical approach initially for reading words and a sublexical approach when reading non-words (Wimmer & Hummer, 1990). It has also been found that the performance of German 7-year-old children in non-word reading correlates highly with their reading of familiar words, whereas it is non-significant in English children, which confirms that a similar approach is used by German beginning readers to read both non-words and familiar words (Wimmer & Goswami, 1994). Wimmer and Goswami (1994) found that errors made in a non-word reading task differed between German and English beginning readers. German children's errors were predominantly other non-words, whereas English children produced errors that were real words. This indicates that German beginning readers due to the

transparency of the orthography have immediate access to letter-sound conversion strategies, whereas English beginning readers due to the inconsistency or irregularity of the orthography also use a direct lexical or whole-word strategy for word recognition (Goswami, Ziegler, Dalton & Schneider, 2003).

It has also been found that children have significantly more difficulty reading non-words in English than German, Spanish or Portuguese, which are all relatively transparent languages (Aro & Wimmer, 2003; Wimmer & Goswami, 1994). Aro and Wimmer (2003) found in a cross-linguistic study that accurate phonological coding poses less of a problem in regular or transparent orthographies, as by the end of Grade 1 non-words in all languages (German, Dutch, Swedish, French, Spanish and Finnish) except English were read with 90% accuracy.

In the present study, because the syllable is a natural, salient phonological unit in Indonesian, then it is predicted that it will play an influential role in the early stages of learning to read. It is expected that the syllable will have greater salience than the rime and possibly be a predictor of reading in Indonesian. In addition, as phonemic awareness and letter knowledge have been found to reliably predict reading cross-linguistically in alphabetic orthographies, then it is expected that this will also be found for Indonesian. As Indonesian is an extremely transparent language, it is also expected that acquisition of both word reading and non-word reading will be relatively rapid in comparison with less transparent languages, e.g. English, French, Danish etc. Furthermore, it is expected that the approach used by beginner readers to read both familiar words and non-words will be a similar sublexical approach and errors will predominantly be non-word errors rather than lexical errors, the substitution of a whole word for the target non-word.

2. Method

2.1. Participants

Seventy-three children (45 boys, 28 girls) from Grade 1 participated in the present study. They were tested in the middle of the school year, after 6 months of schooling. The children ranged in age from 5;9 to 7.11 (mean=6.10; standard deviation=0.45). They attended a public school in a large city in Indonesia. The reading scheme adopted is a phonics approach with an emphasis on the syllable and involves segmenting words into syllables and blending syllables, e.g. *ibu* and *i-bu*.

2.2 Procedure

The children's level of phonological awareness as well as their letter knowledge, word and non-word reading

abilities were assessed. Five tasks of phonological awareness were administered individually to each child in a quiet room in the school: a rhyme detection task, a syllable detection task, an onset detection task, a syllable deletion task and a phoneme deletion task. In addition, children were assessed on letter knowledge and word and non-word reading. Only 56 children due to time constraints were tested on the syllable deletion task. The tasks are described below.

2.3 Phonological awareness tasks

Syllable detection In order to detect children's awareness of syllables in words, children were asked to clap the number of syllables in bi- and multi-syllabic words, e.g. *muka* and *transmigrasi*. Three practice items were given followed by 20 test trials.

Onset detection The onsets used in the task are composed of single phonemes and hence also assesses children's initial phoneme awareness. An oddity task was used to assess children's awareness of onset. The onset task consisted of sets of three words, e.g. *rusa lima rabu* and the child was asked to say which one begins with a different sound from the other two words, i.e. which is the odd one out. The child was given three practice trials followed by 15 test trials.

Rhyme detection The ability to detect rhyme was evaluated through a version of the oddity task as was used in the onset task. The task consisted of three training trials followed by 15 experimental trials. In each trial the child heard three different disyllabic words and had to identify the word that did not end with the same sound as the other two words, e.g. *pantai pisau hijau*.

Syllable deletion The child's task consisted of deleting the first syllable of the word, e.g. *bapak* becomes *pak*. There were three practice trials followed by 15 test trials.

Phoneme deletion The child's task was to delete the first phoneme from 15 words after three practice trials, e.g. *mata* becomes *ata*.

2.3 Letter knowledge and word/non-word reading

Letter knowledge The child was shown 26 lower-case letters printed randomly on a card and asked to name each one of them. A response was considered correct if the child either named the letter or pronounced a syllable beginning with the phoneme corresponding to the target letter.

Word reading The child was asked to read 20 common or familiar words from a word list, which was constructed from words used to teach reading in Indonesian beginning reader primers, e.g. *ibu, rumah, guru*.

Non-word reading The child was asked to read 20 non-words from a word list, which was constructed based on the word reading list e.g. *aco, benap*. Errors were also recorded and later classified as either phonological or

lexical based on Defior, Martos & Cary (2002). Phonological errors involve producing another non-word which is incorrect in some way as it involves a deletion, substitution or inversion of some part of the target non-word. Lexical or logographic errors involve producing a real word for the non-word.

3. Results

Table 1 gives the mean scores, standard deviations and percentage correct responses on the phonological awareness tasks. A series of paired t-tests were performed to see if the children's performance on the phonological awareness tasks were significantly different. It was found that there were significant differences on the syllable detection versus phoneme deletion tasks $t(72)=6.55$, $p<.001$, the syllable detection versus onset tasks $t(72)=8.88$, $p<.001$, the syllable detection versus rhyme tasks $t(72)=10.57$, $p<.001$, the syllable deletion versus phoneme deletion tasks $t(54)=4.62$, $p<.001$, the syllable deletion versus onset tasks $t(55)=6.93$, $p<.001$, the syllable deletion versus rhyme tasks $t(55)=8.77$, $p<.001$, and the onset versus rhyme tasks $t(72)=2.08$, $p<.05$. The syllable detection versus syllable deletion tasks, phoneme deletion versus onset tasks, and phoneme deletion versus rhyme tasks were not significantly different. Hence, it can be seen that children's performance was highest on the two syllable awareness tasks and lowest on the rhyme task, however this was not significantly different from the phoneme deletion task. In addition, performance on the onset task was higher than on the rhyme task.

Table 1: The mean number of correct responses, standard deviations and percentage correct responses on the phonological awareness tasks

Phonological awareness tasks	Mean	S.D.	% correct
Syllable detection (out of 20)	14.71	4.42	73.6
Syllable deletion (out of 15)	11.11	3.26	74.1
Onset detection (out of 15)	7.00	3.66	46.7
Phoneme deletion (out of 15)	6.78	5.87	45.2
Rhyme detection (out of 15)	6.27	3.30	41.8

Table 2 shows children's performance on the letter identification, word reading and non-word reading tasks. It can be seen that children on average could identify 83% of the letters of the alphabet and were able to read about 65% of the common words, and 53% of the non-words. The score on word reading was significantly higher than the score for non-word reading ($t(72)=7.29$,

$p < .001$). From error analysis of the non-word reading task, it was found that 84% of errors were phonological errors and 16% were lexical errors. For example, children had a tendency to give a non-word, phonological response such as *caco* for the non-word item *aco* instead of a real word, lexical response such as *aku* meaning “I”.

Two standard multiple regression analyses were separately performed between the criteria word reading and non-word reading and the six predictor variables, letter knowledge, syllable detection, onset detection, rhyme detection, phoneme deletion and syllable deletion. It can be seen from Table 3, which shows predictor intercorrelations that all the predictors, the phonological awareness and letter identification tasks, have significant bivariate correlations with both word reading and non-word reading. There are also significant intercorrelations between all of the predictors except syllable deletion and syllable detection. In addition, it can be seen from Table 3 that word reading and non-word reading are highly intercorrelated ($r = .89$).

Table 4 displays the multiple regression coefficients of letter knowledge, syllable detection, onset detection, rime detection, phoneme deletion and syllable deletion as predictors of word reading and non-word reading respectively. From Table 4 it can be seen that both letter knowledge and phoneme deletion are the only significant unique predictors of both word reading and non-word reading.

Table 2: The mean number of correct responses, standard deviations and percentage correct responses on the letter identification and reading tasks.

Tasks	Mean	S.D.	% Correct
Letter identification (out of 26)	21.64	3.82	83.23
Word reading (out of 20)	12.96	5.95	64.80
Non-word reading (out of 20)	10.52	6.29	52.60

4. Discussion

In the present study the development of phonological awareness skills and the relationship with reading in Indonesian beginning readers was investigated. It was found that phonemic awareness and letter knowledge play an important predictive role in reading, both

familiar word and non-word reading, which concurs with previous cross-linguistic research. As the syllable is a natural, salient phonological unit in Indonesian, then it was also predicted that syllable awareness would act as a predictor of reading in Indonesian, however this was not found in the present study.

However, it was found that syllabic awareness as assessed by the syllable detection and syllable deletion tasks, was relatively easy for Indonesian children, which indicates that syllabic awareness is relatively early in acquisition and the syllable is a salient unit in Indonesian. Rhyme awareness was not found to be a predictor of reading ability. Furthermore, the rhyme and phoneme deletion tasks were found to be the most difficult tasks for the children, which indicate that the rime is not a salient unit for Indonesian beginning readers. The level of the syllable is a more salient unit than the onset-rime level for Indonesian children. As Indonesian is an exceptionally transparent language, it was expected that the approach used by beginning readers to read both familiar words and non-words would be a similar sublexical approach. This was confirmed to some extent by the strong correlation between word reading and non-word reading. Errors were predominantly phonological or non-word errors rather than the substitution of a whole word for the target non-word, which indicates that children are using a sublexical reading strategy rather than a lexical, whole word reading strategy, which concurs with research on other transparent languages and contrasts with English.

Noticeably, the two syllabic awareness tasks, the syllable detection and syllable deletion tasks were not found to be significantly correlated. The syllable detection task involves identifying the syllables in a word by clapping, whereas the syllable deletion task involves removing the initial syllable from the word. It appears from this result that the two tasks are assessing somewhat different abilities. Adams (1990) has suggested that the syllable detection task assesses the ability to detect rhythm in a language rather than an awareness of the syllable. Furthermore, the syllable deletion task could be assessing the additional skill of morphological awareness in the children. This will be investigated further in the follow-up data collection of children when they are in Grade 2.

In summary, preliminary findings from this study indicate that the order of acquisition of phonological awareness skills differs markedly in Indonesian in comparison with English, and reflects the characteristics of Indonesian, both the spoken language (saliency of the syllable), and the relationship between the spoken language and its orthography.

Further assessments of the children's phonological awareness skills and reading ability will be conducted in Grade 2. In addition to the skills assessed in Grade 1, spelling and morphological awareness will also be evaluated. This will give further insights into the relationship between speech and reading in Indonesian. This research has potentially important pedagogical implications for the teaching of reading in Indonesian, for example rather than teaching reading at the onset-rime level, it is more appropriate to teach at the syllable

level. An additional aim of this research is to determine what the most reliable predictors of reading in Indonesian are, so that readers who are likely to have difficulties in learning to read can be identified early, and appropriate intervention programs can be implemented.

Table 3 Intercorrelations among letter knowledge, syllable detection, onset detection, rhyme detection, phoneme deletion and syllable deletion

Measures	Word reading (criterion)	Non-word reading (criterion)	Letter knowledge	Syllable detection	Onset detection	Rhyme detection	Phoneme deletion
Non-word reading	.890**						
Letter knowledge	.765**	.719**					
Syllable detection	.381**	.441**	.380**				
Onset detection	.557**	.632**	.461**	.384**			
Rhyme detection	.508**	.552**	.395**	.324*	.635**		
Phoneme deletion	.727**	.814**	.538**	.405**	.622**	.686**	
Syllable deletion	.489**	.505**	.323*	.138	.368*	.381*	.504**

** $p < .001$ * $p < .01$

Table 4 Multiple regression coefficients of letter knowledge, syllable detection, onset detection, rhyme detection, phoneme deletion and syllable deletion as predictors of word reading and non-word reading

Measures	Word Reading		Non-word Reading	
	<i>B</i>	β	<i>B</i>	β
Letter knowledge	.787	.505**	.573	.353*
Syllable deletion	9.011E-03	.007	7.793E-02	.056
Onset detection	.113	.069	.243	.144
Rhyme detection	-7.79E-02	-.043	-.183	-.097
Phoneme deletion	.380	.375*	.557	.528*
Syllable deletion	.231	.127	.193	.102
Constant	-9.650		-9.516	

** $p < .001$ * $p < .01$

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