Syllable Awareness of Indonesian Children with Developmental Dyslexia

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Abstract: Goswami (2010) revealed that children had the ability to detect and manipulate the component sounds that comprise words at different grain sizes. They differ from dyslexic children who have difficulties to recognize them. For instance, English dyslexic children showed disabilities to count the number of syllables and were unable to manipulate syllables due to their lack of phonological representation. Therefore, the present study aims to characterize the syllabic awareness of Indonesian dyslexic children. Five dyslexics from Pantara Inclusive Primary School, Jakarta and 25 children from Kwitang 8 Primary School, Depok (chronological age-matched control) were administered two experimental tasks: syllable counting and syllable reversal. This study used quantitative and qualitative methods using a case control study. The instrument consisted of words taken from the 10,000 highest frequency words in a linguistic corpus of Indonesian language. The results generally suggested: 1) dyslexics found difficulties to count and replace syllables for words that have two and three syllables; 2) dyslexics tended to alter CCV syllable to CV syllable; 3) dyslexics substituted phonemes during syllable reversal task; and 3) four out of five control groups were unable to replace syllables in three-syllable-reversal task. This study supports the phonological representation hypothesis of dyslexic children suggested by Goswami (2010).

1 INTRODUCTION

Dyslexia is a specific learning difficulties and a neurological condition caused by a different wiring of the brain (dyslexiaida.org). Young children who have been diagnosed with dyslexia normally have language difficulties when they are three or four years old. They tend to be late in talking, show unclear speech, talk with a long-winded and unsystematic speech, and have difficulties in distinguishing sounds (Reid, 2011; Solek and Kristiantini, 2015). Therefore, when they enter school, they generally have difficulties in reading, spelling, writing (Lyon et al., 2003), and speech perception (Brady et al., 1989; Snowling, 2000; Ziegler, et al., 2009; Sitepu et al., 2017). Dyslexics also seem to have difficulties to identify syllables and letter sounds, and because of those disabilities, they are considered lazy or stupid (Hurford, 1998). In addition, most of those difficulties are attributed to a deficit in phonological awareness (Fawcett and Nicolson, 1995).

In terms of phonological awareness, Fawcett and Nicolson (1995) defined phonological awareness as a metalinguistic skill involving knowledge about the sounds that make up words. However, it has been suggested that dyslexics' poor performance in phonological awareness tasks may reflect inaccuracies in the phonological representations of the words that they are asked to analyze. Swan and Goswami (1997) revealed that phonological awareness skills of dyslexic children depend on the accuracy of the underlying phonological representations of words. Phonological awareness develops as a natural part of language acquisition. At the time children learn sounds, their brains develop phonological representations of the sound structure of individual words. Hence, normal children first gain awareness of syllables when they turn to three years old and they are able to distinguish syllable like */ba/* and */ga/* perceptually within the first month of life (Goswami, 2010).

The ability of children to distinguish syllables has been examined by Liberman et al (1974). They measure the syllable awareness ability of American children by asking them to clap their hands once for words which have one syllable (i.e., *dog*), clap their hands two times when they heard words which have two syllables (i.e., *tur-key*), and clap their hands three times for words that have three syllables (i.e., *pres-i-*

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dent). As a result, the criterion is passed by 90 per cent of the 6-year-old children. Similar evidence of success at the syllable level has been found by Treiman and Baron (1981). It is reported that good awareness of syllables was demonstrated by 5-year-old American pre-readers when they were asked to count the number of syllables. For instance, when they were asked to count the number of syllable of *rabbit*, the children were able to set out two counters.

Furthermore, Cossu et al (1988) asked Italian pre-readers (aged 4-5, and 7-8) to tap out the number of syllables in words like *gatto* 'cat', *melone* 'melon' and *termometro* 'thermometer'. Criterion is also reached by 80 per cent of the aged 5 children and 100 per cent of the school-age sample. Hoein et al (1995) tested the Norwegian pre-schoolers using a similar syllable-counting test, and the performance is 83 per cent correct (i.e., *telephone* = 3 marks).

Based on the success at the syllable level by the normal children and the differences with the children who have reading disorders, Swan and Goswami (1997) compared the phonological awareness skill of English dyslexic children, poor readers and their chronological age-matched control group by administering syllable tapping task of words with one syllable (e.g. *clock, queen*), three syllables (e.g. *hospital, potatoes*) and four/five syllables (e.g. *television, electricity*). The results suggested that dyslexic children showed significantly lower syllable awareness skill than the chronological age-matched control (*ps* < .01), but were significantly higher than the group of poor readers ($p < 0.05$) and all subjects were equally proficient at the syllabic analysis of short and long words.

Similar with the finding of Swan and Goswami (1997), Bruck (1992) also found the same results with dyslexic children selected from the patient population of a clinic specializing in the assessment and treatment of specific reading disorders. Children were asked to listen to a non-word on a tape recorder and then were asked to use blocks as counters to indicate the number of syllables in the non-word. Bruck (1992) found dyslexic children made more errors than their chronological-age matched controls on all phonological awareness measures, especially on the syllable awareness, such as the dyslexic children made syllable counting errors ($f(1,26)=9,41$, $p<0,05$). Dyslexic children also made fewer overshoot responses on digraph errors in the phoneme counting task [$f(1.26) =13.94$, $p<.0.01$), and made single-letter deletion responses on digraph errors in the deletion task [$f(1.13) =6.71$, $p<0, 05$].

In line with the aforementioned investigations, this study aims to characterize the syllable awareness skill of Indonesian dyslexic children. These tasks are devised to measure the syllable awareness of Indonesian dyslexic children and their chronological age-matched control groups, particularly analyzing the children's ability to recognize short and long words containing simple consonant-vowel sounds and consonant clusters. On the one hand, this study will uncover new findings regarding the syllable awareness of Indonesian dyslexic children and help parents and therapists to examine the syllable knowledge of children. On the other hand, the result findings can show what kind of syllable is the most difficult for dyslexic children. The scope is only on the investigation of the production and recognition of syllable awareness of Indonesian children by administering them with syllable counting and syllable reversal tasks.

In addition, based on the previous studies, it is observed that results of normal children examined by Treiman and Baron (1981), Cossu et al. (1988) and the control group of Bruck (1992) are in line with those of Goswami (2010). They differ from the phonological awareness skill of dyslexics found by Bruck (1992). The finding provides strong evidence that dyslexic children suffer from a disorder in syllable awareness skill which persists in 7 or 8-year-old children. The comparison between the normal and dyslexic children indicates that the children with dyslexia are deficient in all areas of phonological awareness. However, despite showing persisting phonological awareness deficits of dyslexics remaining as a crucial stumbling block for the acquisition of fluent words recognition skills, the data show that Bruck (1992) did not collect IQ or intelligence level information for the normal children.

Moreover, Bruck (1992) asked children to count the number of syllables in non-words that contained two, three and four syllables. Along the same line, the present study intends to see whether the Indonesian children with dyslexia in an orthographically transparent language also show poor performance in syllable awareness like the findings of Bruck (1992), and Swan and Goswami (1997). The current study uses simple CV words and consonant clusters that contain two and three syllables only. It is also investigated whether any deficit uncovered also reflects inaccuracies in the phonological representations of the words as proposed by the phonological representation hypothesis of Goswami (2010).

2 METHODS

The method of this study is quantitative and qualitative with a case control study approach. Dyslexic children and control groups are observed and interviewed. The children are administered with two syllable awareness tasks: syllable counting and syllable reversal tasks. Then, the correct answer is counted. The syllable awareness skill of Indonesian children with dyslexia is compared with the skill of chronological age-matched control groups by using *t-test independent* (SPSS). The children's skill is investigated by asking them to count the number of syllables of 48 words (24 words with two syllables and 24 words with three syllables, and the words contain simple CV syllables and consonant clusters). Examples of syllable counting and syllable reversal for words with two syllables and simple words type are *bayi* 'baby', *daging* 'meat', *gizi* 'nutrition'; for three syllables with clusters : *drama* 'drama', *global* 'global', *gratis* 'for free', three syllables for simple words: *merdeka* 'independent', *bakteri* 'bacteria', *bendera* 'flag'; three syllables with clusters : *promosi* 'promotion', *presiden* 'president', *pribadi* 'private'.

This study involves five Indonesian children with dyslexia from Pantara Inclusive Primary School based in Tebet, Jakarta. To qualify for the study, the dyslexic children needed to attain an IQ score above 91 on the WISC-R (Wechsler, average IQ in Wechsler ranging from 91 to 110), aged 7-9 (3 males (aged 7-8), 2 females (aged 8-9)); living in an urban area; speaking Bahasa Indonesia; and having parents who graduated at least from high school. All the children with dyslexia had been diagnosed as dyslexics. The dyslexics are referred to as DA (IQ=92), DB (IQ=92), DC (IQ=92), DD (IQ=96), DE (IQ=93), and as for the control groups, CA, CB, CC, CD and CE.

The chronological age-matched control group is selected from Kwitang 8 Primary School, Pancoran Mas, Depok. Inclusion criteria of the control group are children aged 7 or who already studied in primary school; without any psychological interference; living in urban areas; having average level of intelligence; having no speaking problems as experienced by children with deafness or muteness; and were fluent in Bahasa Indonesia. The intelligence test for the control group was conducted in mass on May 29th, 2017. None of the children selected for the control group showed below-average level of intelligence. The children were 7 years old (n=5), 8 years old (n=15) and 9 years old (n=5). The control group selected shows the same age and sex with those of children with dyslexia.

The test administrations is the following. First, the children hear words on a recorder and clap their hands as counters to indicate the number of syllables. Second, the children are asked to move the last syllable to the front of the words. All words used at the syllable reversal task are similar with the words used during the syllable counting task. All words used in these tasks are taken from 10,000 words with the highest frequency according to a linguistic corpus of Bahasa Indonesia (Indonesianwac corpus) in 2016.

Subjects are tested individually. Two experimental tasks are administered to all children, among them: syllable counting and syllable reversal test. As for the syllable counting tasks, subjects are asked to count the number of syllables (clapping hands) of words they hear from the recorder (i.e., simple words: *bayi* 'baby' (two times); *merdeka* 'independent' (three times); consonant clusters: *drama* 'drama' (two times), *presiden* 'president' (three times). If children count the syllables incorrectly or do not say anything, then the children get a null score. Afterwards, they are asked to replace the last syllable of each word and place the syllable to become the first syllable. For example, when they are asked to replace the last syllable of *ba**yi*** (baby), they have to say ***yi**ba*. For the words which consist of three syllables, when they are asked to replace the last syllable of *presi**den*** (president), they have to move *den* forward (become first syllable) and say ***den**presi*.

3 FINDING AND DISCUSSION

3.1 Results of t-test Independent Test

The syllable counting and syllable reversal ability of words with two syllables and three syllables of dyslexic children are compared with that of control group by using t-test independent statistic test. The average score of syllable counting of the child with dyslexia A (DA) with that of control group A (CA) shows that for two syllable-words, *mean* DA=24, SD=0; *mean* CA=23.00, SD=1.000, t=0.00, p=0.413 or p>0.05, and for three syllables: *mean* DA=0.00, SD=0; *mean* CA=15.60, SD=5.899, t=-2.41, p=0.073 or p>0.05. As for the syllable reversal task, the result shows *mean* DA=1.00, SD=0; *mean* CA=17.60, SD=17.60, t=-2.08, p=0.105, or p>0.05; for the three syllables, the result shows *mean* DA=0.00, SD=0; *mean* CA=15,60, SD=5.899, t=-2.41, p=0.073 or p>0.05, as for the control group, the result shows *mean* DA=4.00, SD=0.

For DB compared with CB, the result of words with two syllables shows *mean* DB=24.00, SD=0;

mean CB=23.20, SD=0.837, t=-19.33 p=0.43 or p>0.05, and for words with three syllables, *mean* DB=11.00, SD=0; *mean* CB=23.00, SD=1.000, t=-20.82, p=0.000 or p<0.05. As for the syllable reversal task of two syllables, the result shows *mean* DB=4.00, SD=0; *mean* CB=18.00, SD=6.058, t=-2.230, p=0.90 or p>0.05, and for words which have three syllables, mean DB=0.00, SD=0; *mean* CB=15.60, SD=5.899, t=-2.41, p=0.073 or p>0.05.

For the comparison of the performance of DC with that of CC, the statistic result shows *mean* DC=24.00, SD=0; *mean* CC=23.20, SD=0.837, t=0.873, p=0.432, or p>0.05, and for words which have three syllables, *mean* DC=11.00, SD=0; CC=23.00, SD=1.000, t=-10.954, p=0.000, or p<0.000. As for the syllable reversal task, DC shows *mean*=1.00, SD=0; *mean* CC=20.60, SD=2.074, t=-6.62, p=0.001, or p<0.05; for the words which have three syllables, *mean* DC=0.00, SD=0; *mean* CC=17.20, SD=3.564, t=-4.40, p=0.012, or p<0.05.

For the comparison of the ability of DD with that of CD, the statistic result in counting shows *mean* DD=18.00, SD=0; *mean* CD=23.40, SD=0.894, t=-5.51, p=0.005, or p<0.05, as for the result of three syllables shows *mean* DD=7.00, SD=0; *mean* CD=32.40, SD=0.894 t=-16.73, p=0.000, p<0.05. As for the task of syllable reversal, the result shows *mean* DD=17.00, SD=0; *mean* CD=11.80, SD=12.00, t=0.39, p=0.713 or p>0.05; for the words which have three syllables, the result shows *mean* DD=3.00, SD=0; *mean* CD=11.60, SD=12.03, t=-0.65, p=0.550, p>0.05.

In the comparison of the ability of DE with that of CE, the statistic result in counting syllable of words with two syllables shows *mean* DE=2.00, SD=0; *mean* CE=21.20, SD=6.261, t=-2.79, p=0.049 or p<0.05, as for the words of three syllables shows *mean* DE=22.00, SD=0; *mean* CE=23.20, SD=1.789, t=-0.61, p=0.573, p>0.05). For the task of replacing syllables, DE shows *mean* DE=2.00, SD=0; CE=24.00, SD=0.000, t=0; for the words which have three syllables, the result shows *mean* DE=0.00, SD=0; *mean* CE=22.60, SD=0.894, t=-23.06, p=0.000, or p<0.05. In summary, 4 out of 5 children with dyslexia have difficulty in syllable counting (see figure 1) (DB, DC, DD, DE) and 2 out of 5 dyslexic children have difficulties in syllable reversal task (DB, DE). The percentage of syllable awareness skill of Indonesian dyslexic children with the control group can be seen at Figure 1 and 2.

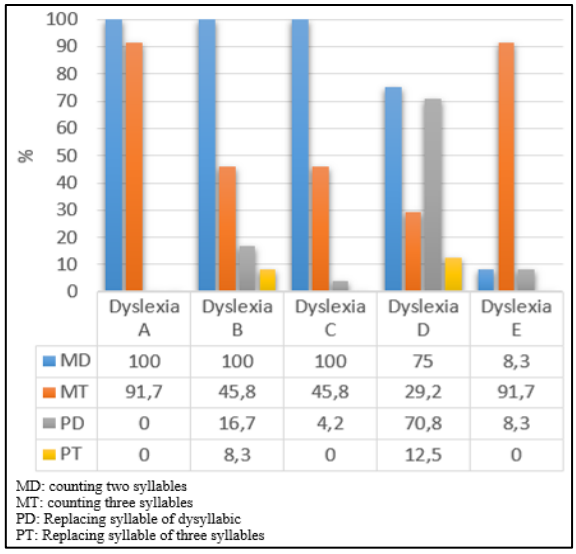

Figure 1: Syllable awareness ability of dyslexic children.

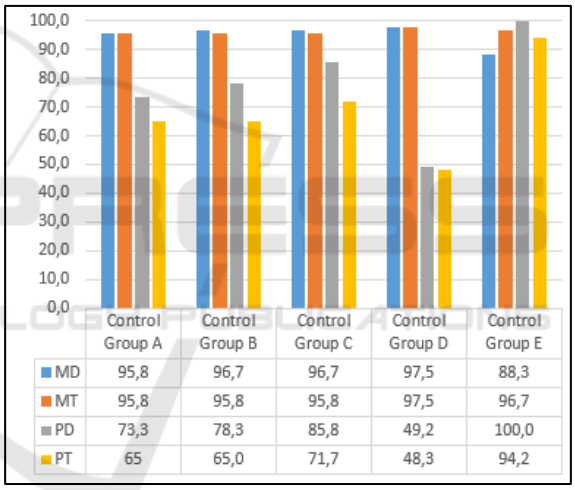

Figure 2: Syllable awareness ability of control group.

Based on the aforesaid quantitative measures, the present study's results differ from the normal children's skill in general, similar with the finding of Cossu et al. (1988) who ask Italian children aged 7-8-year-old to tap out the number of syllables in words. Criterion is reached by 100% of the school-age sample, 80% of the 5-year-old, and 67% of the 4-year-old. In addition, the present result is also consistent with Treiman and Baron (1981, look at Goswami, 2010) who found 90% of 6-year-old and 100% of 7-year-old succeeded to count the number of syllables. The results also support Swan and Goswami (1997) and Bruck (1992) who found that the dyslexics show significantly lower results than the chronological age-matched control in syllable counting task. Although Bruck (1992) did not collect

the IQ data of normal children, this study shows that the disability of dyslexics may not be confounded by either IQ or intelligence level differences. Yet, the present study is inconsistent with previous findings suggesting that all subjects were equally proficient at the syllabic analysis of short and long words, because this study result shows that Indonesian dyslexic children find difficulties to count syllables neither short nor long words.

3.2 Results of the Qualitative Analysis

Based on the qualitative research, it is observed that dyslexic children tend to change complex syllable structures to become simple ones during the syllable counting task. Two out of five dyslexic children also tend to substitute vowels during the syllable reversal task, but mostly, dyslexic children are not able to replace syllable and they tend to shorten the length of syllables.

3.3 Syllable Structure

Dyslexic children tend to alter syllable structure during the syllable reversal task. They alter the syllable structure of CVC to CCV [(DA; n=5), (DB; n=5)]; CCV to CVC [(DC; n=1), (DD; n=2), (DE; n=2)]; CV to CCV [(DA; n=1), (DB; n=4), (DC; n=1), (DE; n=8)]; CV to CVC [(DA; n=1), (DB; n=2), (DC; n=2), (DD; n=7), (DE; n=7)]; CVC to CV (DA; n=13), (DB; n=9), (DC; n=8), (DD n=5) and (DE; n=2)]. For instance: when DA is asked to replace *sing* of the word *pusing* 'dizzy' (CV-CVC) forward, he answers *sipung* (CV-CVC) instead of *singpu* (CVC-CV). As for the alteration of CCV to be CV, dyslexic children tend to alter CCV to be CV syllables [(DA; n=12), (DB; n=5) and (DC; n=3), (DE; n=16)]. For instance, when DA is asked to replace *fik* of word *spesifik* 'specific' (CCV-CV-CVC), he says *visiti* (CV-CV-CV) instead of *fikspesi*; and DB alters *studi* 'study' (CCV-CV) to *ditus* (CV-CVC) instead of *distu*.

3.4 Phoneme Substitution and Word Addition

It is observed that DA and DB do not replace syllables but tend to alter vowel sounds to /i/. DA alters /a/ sound to be /i/ (n= 24), /u/ sound to be /i/ (n=4), and /ɛ/ to be /i/ (n= 14). For instance, *planet* 'planet' to be *plipi*; *gratis* 'for free' to be *gritis.* As for DB, he alters *wanita* 'woman' to be 'tiwani'. The dyslexics also show varying performances during the syllable awareness tasks. The dyslexics cannot execute the instruction syllable DA, DC and DE given by the examiner. As for the syllable reversal task, they are unable to replace syllables as instructed. For example, when DE is asked to replace the syllable of the word *gratis* 'for free', she says *oke* instead of *tisgra*. For the word *kopi* 'coffee', DE says *kopi pahit* 'bitter coffee' instead of *piko.*

4 CONCLUSIONS

Based on the results of this study, the difficulties to distinguish syllable structure and to do syllable segmentation indicated that Indonesian children with dyslexia have phonological awareness deficit due to their lack of phonological representation in the brain (Goswami, 2010). Indonesian dyslexics find difficulties to count the number of syllables for words that have three syllables and contain simple syllable structures and consonant clusters. Furthermore, dyslexics also tend to substitute CVC and CCV to CV syllables and substitute vowel sounds. Hence, the study result is consistent with the finding of Swan and Goswami (1997) that dyslexic children's performance in counting the number of syllables is significantly lower than that of the control group, but inconsistent with the finding stating that there is no difference in the length of syllables. In addition, the result also supports the finding of Bruck (1992) that finds dyslexics are less successful than control group in identifying words which contain simple syllable structure. Moreover, the average ability of the control group to count the number of syllable is 97%. This is consistent with the ability of Italian children suggested by Cossu et al (1988), and Treiman and Baron (1981).

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