The effect of phonological instruction for struggling readers in elementary

Ranti Novianti[1] and Syihabuddin[2]

[1]*Special Education Study Program, Faculty of Teacher Training and Education, Universitas Islam Nusantara, Jl. Soekarno-Hatta No.530, Sekejati, Bandung, West Java, Indonesia*
[2]*Arabic Education Study Program, Faculty of Language and Literature Education, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudhi No. 229, Bandung, West Java, Indonesia*

ABSTRACT

This study aims to determine the impact of phonological instruction interventions on dyslexic students in elementary schools. We tested the effect of phonological instruction on phonological awareness, reading, and spelling skills in 4 participants who had almost similar reading difficulties at different grade levels. This study used an experime11ntal design method single-subject research (SSR). The SSR design used is the A-B-A design which consists of three stages of conditions, namely: A-1 (baseline 1), B (intervention), A-2 (baseline 2). Tests were given to measure baseline and intervention results of phonology awareness tests, reading tests, and spelling tests. Measurement of ability at the baseline was given as many as 4 sessions while the intervention for 12 sessions. The results showed that phonological instruction had an effect on increasing phonological awareness, reading and spelling skills. The significant effect of phonological instruction interventions suggests that understanding phonological principles is beneficial for students with dyslexia.

Keywords: Phonological awareness; phonological instruction; reading and spelling; struggling readers

INTRODUCTION

Reading is an important skill needed to achieve success in academia, work, and even in social life (McGill, 2016; Niklas et al., 2016; Oakhill et al., 2015). Reading is a complex process for understanding writing (Oakhill et al., 2019; Smith, 2012). Reading is a combination of two components, namely decoding and understanding of language (Clarke et al., 2013). Many elementary school students have difficulty reading (Inns et al., 2019; Kame'enui et al., 2015). Only about 1/3 of students in primary school classes have good reading skills (National Center for Education Statistics, 2017).

Students who have difficulty reading include dyslexic students (Novianti et al., 2019). Dyslexia is a neurobiological disorder that results in difficulties in reading accurately so that it affects reading fluency (Horowitz-Kraus & Breznitz, 2014; Razuk et al., 2018; Shaywitz et al., 2004; Vandermosten et al., 2016) and has an impact on reading comprehension (Catts et al., 2005; Hjetland et al., 2017; Hulme et al., 2015; Lervåg et al., 2018; Language and Reading Research Consortium, 2015; Moats et al., 2010). It is estimated that 5–10% of the population is identified as having dyslexia (Nilsson et al., 2016).

The main cause of dyslexic students having difficulty reading is a deficit of phonological awareness (Franceschini et al., 2017; Lervåg & Hulme, 2009; Ramus, 2006; Snowling et al., 2019; Snowling & Melby-Lervåg, 2016). Lack of

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*Corresponding Author
Email: rantinovianti.2020@gmail.com

phonological awareness causes difficulty in decoding in dyslexic children (Carvalhais et al., 2020; Dickens et al., 2019; Hulme & Snowling, 2016; Snowling et al., 2020; Snowling & Hulme, 2012; Kuster et al., 2018; Lyon et al., 2003; Norton & Wolf, 2012; Snellings et al., 2009).

Reading is a linguistic activity that requires mastery in linguistic aspects, including phonological awareness (Berninger et al., 2010; Fawcett, 2003; Hulme et al., 2015; Lervåg et al., 2018; Lyon, 2002; Storch & Whitehurst, 2002). Phonological awareness is generally defined as the ability to identify and manipulate language sounds (Vander Stappen & Reybroeck, 2018). Practically speaking, phonological awareness is very important for children to translate written symbols in the form of letters and letter patterns into understandable language sounds. In general, phonological awareness is known as grapheme-to-phoneme, the basis of coding skills. If a child cannot understand the differences of sounds in spoken language, they will have difficulty decoding or reading words accurately and fluently (Mather & Wendling, 2012).

There are still few studies that discuss reading interventions for dyslexic students (Mather & Wendling, 2012). To date, research on specific interventions in reading for dyslexic students is still lacking and there is no one method that is suitable for all children (Wadlington, 2000). Currently, learning, in general, is often unable to handle dyslexic students appropriately (Denton & Al Otaiba, 2011). The existence of dyslexia in students is often not realized by the teacher, as a result, these students are forced to take part in learning activities according to the standards that apply to all students in general and they are often labeled as stupid children (Widodo et al., 2020).

Teachers function as guides and educators who are expected to make efforts to deal with student learning difficulties, including students with dyslexia (Chitsa & Mpofu, 2016; Reardon & Portilla; 2016). But in reality, teachers experience difficulties when teaching dyslexic children, especially in the use of learning methods, as well as the teacher's lack of knowledge about what dyslexia is, so that teachers do not understand the characteristics of dyslexic children. Teachers may feel that they have done various ways so that dyslexic children get success in learning, but in reality, this has not happened (Mardhiyah et al., 2019). This, in turn, worsens the condition of dyslexic students in schools (Kalsoom et al., 2020).

Based on the research results, students whose reading and writing abilities are far below the ability of their peers are at risk of experiencing low self-esteem, shame, and lack of self-confidence. Interventions that are late given, also have a big impact on students' motivation in reading (Snowling & Hulme, 2011). Students who received the intervention earlier, in grades 1 and 2 of primary school had a better impact than students who were late given the intervention. (Ahmed, 2018; Lovett et al., 2017).

Phonological awareness has been shown to be the basis of success in reading, by increasing phonological awareness will improve reading skills. (Dai et al., 2016; Layes et al., 2020; Mather & Wendling, 2012; Peters et al., 2019; Pfost et al., 2019; Snellings et al., 2009; Wang, 2017). Therefore, it is very important for dyslexic students to get special instruction in phonological awareness because this teaching has an impact on reading ability (Berninger & Wolf, 2009). Phonological instruction has several sections namely word awareness instruction, syllabic instruction, and phonemic instruction (Novianti et al., 2019). Phonological instruction in essence teaches skills blending, segmenting, deleting, addition, substitution, and isolation sounds at the word, syllable, and phoneme level. All of these things are the basics of the ability to manipulate sound as a basic ability to do it decoding on reading activity (Hulme & Snowling, 2016).

Word awareness instruction covers several abilities that are taught and trained, such as; (1) word blending, namely combining the sound of two words into one word (phrase) with a new meaning; (2) word segmenting, namely segmenting/breaking phrases into two words with new meanings; (3) word deleting (phrase), which is omitting one of the words in the phrase; and (4) word deleting (word), which is removing one of the syllables in a word so that it forms a new word meaning. Syllabic instruction covers several abilities that will be taught and trained, including; (1) syllable blending, namely combining syllables into a word; (2) syllable segmenting, namely separating/breaking the word into several parts of the syllable; (3) syllable deleting, namely removing some of the syllables in the word; (4) syllable substitution, namely changing syllables to form new words.

Phonemic instruction covers several abilities that will be taught and trained, including; (1) phonemic isolation, where it is taught to separate one of the phonemes sounds in a word, usually, a phoneme that is located at the beginning or end of a word; (2) phonemic blending, combine separate phoneme sounds into one complete word; (3) phonemic segmenting, break one word into several phonemes; (4) phonemic deleting, eliminating one phoneme in a word; (5) phonemic addition, adding a phoneme to a word which forms a new sound but has no meaning; (6) phonemic substitution, replacing phonemes in words so that they can form meaningless new words. (Novianti et al., 2019).

METHOD

Participants

The research participants were 4 male students and selected by purposive sampling technique. The characteristics of the research participants were almost the same, namely dyslexic students, as evidenced by the DSMV checklist instrument and IQ test. The participants had difficulties in reading, had learned to read, and were declared failing / not progressing. The research participants are currently in grades 1, 2, and 3 in an elementary school. Class level is not a benchmark for participant selection, but rather on the criteria that the participants have, namely dyslexia and having similar reading difficulties.

Instruments

Phonological awareness test

Phonological awareness test using Clinical Assessment of Phonological Processing Standard Indonesia (CAPP-SI). This test tool aims to identify important components that form the basis of developing literacy skills. Each test developed is based on the Domino and Domino theory (2006), meanwhile, phonological processing theory from Torgesen (2007) is used in construction and development.

Clinical Assessment of Phonological Processing Standard Indonesia (CAPP-SI) has three subtests consisting of phonological awareness, phonological memory, and phonological naming or rapid automatized naming (RAN). On phonological awareness has six subtests, consisting of; syllable blending, syllable awareness, syllable deletion, phoneme counting, phoneme deletion, and phoneme blending. Each subtest has 10 items, one item that responds correctly will be given a score of 1, while the item that responds incorrectly will be given a score of 0. This test aims to identify precursors from phonological coding which is one of the basics of decoding skill or fluent-print word recognition skill (Pennington, 2009)

On phonological memory, which has two subtests, consist of number memory forward (verbal memory span) and number memory reversed (working memory). Each subtest has six items. The first item has two digits, the second item has three digits, the third item has four digits, and so on. The score is determined based on the number of items that were answered correctly. For example, if the child is only able to respond to item two, the child's score will be three, because item two has three digits. This test aims to identify precursors from listening which is one ability that is important for reading (Pennington, 2009).

The phonological naming or rapid naming has only one item. The child is asked to name 50 colors on a sheet of paper as quickly as possible. The total color correctly named for one minute becomes the score to be obtained. This test aims to identify precursors from orthographic coding which is one of the basics of fluent-print word recognition skills (Pennington, 2009).

Reading and spelling test

The test instrument used to determine students' reading and spelling skills was to use a test instrument that was adapted and developed from the Early Grade Reading Assessment (EGRA). Early Grade Reading Assessment Toolkit, Second Edition covers listening comprehension, letter identification, nonword reading, and oral reading fluency with comprehension (Dubeck & Gove, 2015). The adapted and developed pre-reading assessment instrument is called a decoding test, consisting of (1) letter identification: letter names and letter sounds; (2) word reading; and (3) oral reading fluency.

A letter identification test was conducted to determine the participants' ability alphabet knowledge namely the ability to say the names of letters, both lowercase and capital letters, and say the sounds of letters randomly. Word reading comprehension was delivered to see the participants' ability to understand the relationship between graphemes and phonemes by reading the letter symbols that have been formed into syllables. While the oral reading fluency was administered to examine the participants' ability to read words accurately and fluently and understand the meaning. The total number of these tests is 138 items with a score of 1 if correct and 0 for incorrect answers.

The spelling assessment instrument that has been adapted and developed is called the spelling test, which consists of word spelling. In word spelling, tests were conducted to determine the participants' ability to write patterned words vowel (V) and consonant (C) as follows: (1) V-CV; (2) CV-CV; (3); CV-CVC; (4) CVC-CVC; (5) V-VC / CV-VC; (6) CCV-CV / CCV-CVC; (7) CV-CVV / CVC-CVV. Each word pattern consists of 5 questions and the total questions are 35 questions with the criteria for scoring 1 if true and 0 for false answers.

Procedures

This study used an experimental design method single-subject research (SSR). The purpose of this study was to determine the effect of phonological instruction applied to students by looking at the impact of changes in students' phonological awareness, reading, and spelling skills between before and after the intervention.

The SSR design used is the A-B-A design which consists of three stages of conditions, namely: A-1 (baseline 1), B (intervention), A-2 (baseline 2). A-B-A design was chosen because it can show whether there is an influence between the independent variable and the dependent variable. The independent variable in this study was phonological instruction and the dependent variable

was the ability of the dyslexic students to have phonological awareness, reading skills, and spelling.

The SSR design used is the ABA design which consists of three stages of conditions, namely: A-1 (baseline 1), B (intervention), A-2 (baseline 2). The procedure is to first measure the target behavior at baseline conditions (A1) with a certain period then continue at the intervention condition (B), after measurement in the intervention condition (B), then the measurement at the second baseline condition (A2) is given.

A-1 (baseline 1) is an initial condition, in this case, namely the ability of phonological awareness, reading skills, and spelling. Measurements in this phase were carried out several times until the data showed stable results, with the duration being adjusted to the school hours, which was 1 lesson hour (1 X 30 minutes). Meanwhile, B (intervention) is to determine the data on the participants' phonological awareness, reading, and spelling skills after being given treatment or intervention. At this stage, the participants were given treatment in the form of phonological instruction. The intervention was given several times until there was a change in the participants' phonological awareness, reading, and spelling skills. The intervention process for each session takes 30 minutes, for 1 lesson hour at school.

Data analysis
Data were analyzed using quantitative data analysis. Quantitative data is processed through descriptive analysis. After the data has been collected, the data were processed and analyzed into descriptive statistics with the aim of obtaining a clear picture of the results of the intervention. Data analysis in this stage aims to see to what extent the effect of the intervention on the abilities to be changed, namely the ability of phonological awareness, reading and spelling skills of dyslexic students.

The process of data analysis in single-subject research presents a lot of data in graphs. The purpose of the graphic in this study is to make it easier to explain changes in the participants' abilities efficiently and in detail. The graphic form used is a line graph. The use of this graph is expected to clarify the picture of the implementation of the experiment before being given treatment/intervention or after being given the intervention, and the changes that occur after the intervention is given.

There are several things that concern researchers in analyzing data using visual analysis methods through charts, namely the number of data points (scores) in each condition, the number of dependent variables that want to be changed, the level of stability, and changes in data levels in a condition or between conditions, direction changes in conditions and between conditions.

FINDINGS AND DISCUSSION
Based on the results of the study, phonological instruction has a positive impact on increasing the ability of dyslexic students to phonological awareness (see Figure 1), early reading ability (see Figure 2), and spelling (see Figure 3) starting from baseline 1 (A-1), intervention (B), to baseline 2 (A-2). The increase in the participants' ability in phonological awareness is indicated by an increase in the test result score Clinical Assessment of Phonological Processing Standard Indonesia (CAPP-SI), the increasing ability of the participants in reading is indicated by an increase in score decoding test, The increase in the participants' ability in spelling was indicated by the increase in the spelling test score after the intervention/provision of phonological instructions.

Based on the results of research data analysis that has been carried out with several steps, data overlap at baseline conditions, and the intervention of the four participants is not more than 50%, which means that the effect of the intervention can be believed. The following are the steps that have been taken when analyzing research data: 1) calculating the score and percentage of measurement results in the baseline phase; 2) calculating the score and percentage of measurement results in the intervention phase; 3) creating tables and graphs of research data from the baseline and intervention phases; 4) make data analysis in conditions and analysis between conditions to determine the effect or influence of the intervention on the target behavior.

The components of the analysis in conditions include (1) length of condition, (2) estimation of directional trend, (3) trend stability, (4) data-trace, (5) level of stability, and (6) level change. While the components of data analysis between conditions include: (1) the number of variables, (2) changes in the direction of trends and their effects, (3) changes in stability trends, (4) level change, and (5) percentage overlap.

Table 1 displays the scores of the phonological awareness, early reading comprehension, and spelling ability on participants 1, 2, 3, and 4 before the intervention, during the intervention, and after the intervention.

As can be seen in Table 1, the scores obtained from the four participants had increased. The increase was seen significantly from the stage during the intervention. This can be seen from the increase in the initial baseline, which was generally obtained by 10% increasing to 70% at the end of the intervention.

The results of the data for the four participants in measuring the ability of phonological awareness at baseline-1 (A-1), intervention (B), and baseline-2 (A-2) conditions are shown in Figure 1.

Table 1

The Development of Phonological Awareness Ability, Early Reading and Spelling Participants 1, 2, 3 and 4 (ABA Design)

P	Aspect	Baseline 1				Intervention											Baseline 2			
		1	2	3	4	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
1	**Ph**	37	40	38	39	41	42	52	60	61	61	61	63	66	69	69	74	74	73	74	75
	R	40	39	40	42	53	56	65	69	69	75	74	77	77	81	81	82	82	81	82	82
	S	0	0	0	0	3	6	15	19	19	25	24	27	27	31	31	32	32	31	32	32
2	**Ph**	41	39	39	41	44	42	53	53	53	60	60	60	68	68	68	73	73	74	74	75
	R	30	30	25	30	39	39	52	52	57	59	58	62	67	70	75	77	77	77	77	78
	S	0	0	0	0	0	0	2	2	7	9	8	12	17	20	25	27	27	27	27	28
3	**Ph**	23	26	26	27	28	28	34	34	34	52	52	52	64	64	64	85	85	86	86	86
	R	43	50	49	52	52	52	52	68	68	85	85	85	88	89	89	89	89	89	89	90
	S	0	0	0	2	2	2	2	18	18	35	35	35	38	39	39	39	39	39	39	40
4	**Ph**	42	44	43	46	46	42	42	46	46	50	50	50	65	65	66	73	80	80	78	80
	R	35	37	40	36	36	38	38	47	47	51	51	57	57	65	70	77	77	76	77	78
	S	0	0	0	0	0	0	0	0	0	1	1	7	7	15	20	27	27	26	27	28

|	
P = Participant	Phonology test maximum score = 154
Ph = Phonology	Spelling test maximum score = 75
R = Reading	Reading comprehension test maximum score = 138
S = Spelling	

Based on Figure 1, it can be seen that the ability of phonological awareness of the four research participants has increased since the intervention in the form of phonological instruction was given. The increase was seen significantly from the stage during

the intervention at session 5 until session 16.

The results of the data for the four participants in measuring the ability to read at baseline-1 (A-1), intervention (B), and baseline-2 (A-2) conditions are shown in Figure 2.

Figure 1

The Development of Phonological Awareness Ability Participants 1, 2, 3, and 4 (ABA Design)
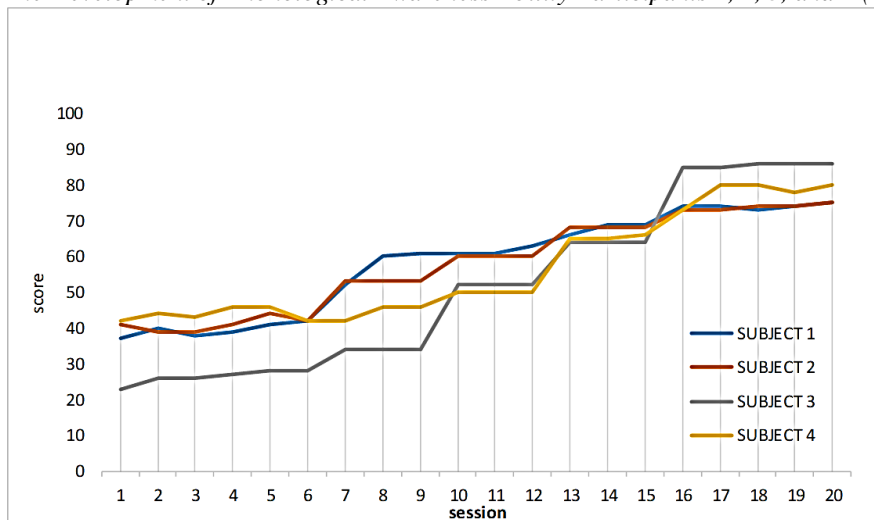
Based on Figure 2, it can be seen that the ability to read the four research participants has increased since the intervention in the form of phonological instruction was given. The increase

was seen significantly from the stage during the intervention at session 5 until session 16.

Furthermore, the results of the data for the four participants in measuring the ability of spelling at

*Corresponding Author
Email: rantinovianti.2020@gmail.com

baseline-1 (A-1), intervention (B), and baseline-2 (A-2) conditions are shown in Figure 3.

Figure 3 shows that the ability of spelling of the four research participants has increased since the intervention in the form of phonological instruction was given.

Based on Figures 1, 2, 3, it can be seen that the ability of phonological awareness, reading, and spelling of the four research participants has increased. This is because, in the phonological instruction process, phonological awareness is first developed as a means of reading and spelling skills. The series of reading interventions does not only start from recognizing letters, reading words,

sentences and paragraphs. However, previously, intervention in the form of phonological instruction, which included word awareness instruction, syllabic instruction, and phonemic instruction.

The success in the reading process is mainly influenced by good linguistic skills, especially in the aspect of phonology. This has implications for the selected and developed reading interventions that teach about phonology very important to do as an early stage in teaching reading. Based on the results of this study, the teaching process of reading does not go directly to reading, but there are conditions that must be mastered, then reading failure will occur.
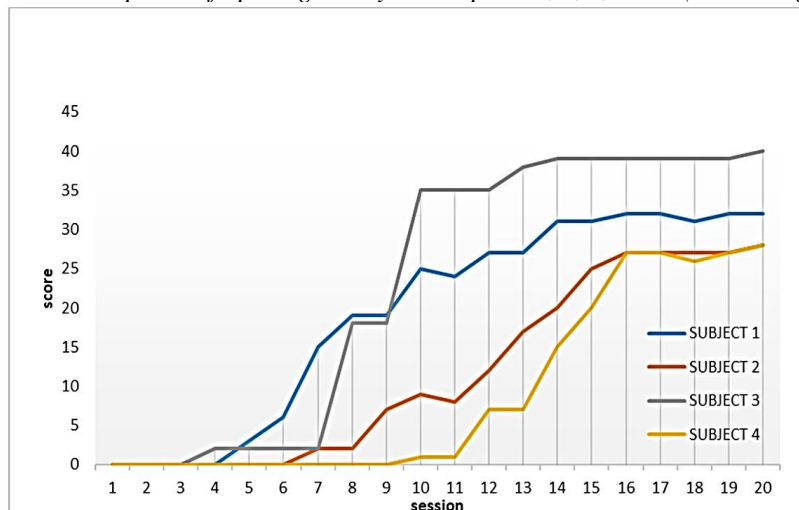
Figure 2
The Development of Early Reading Ability Participants 1, 2, 3, and 4 (ABA Design)
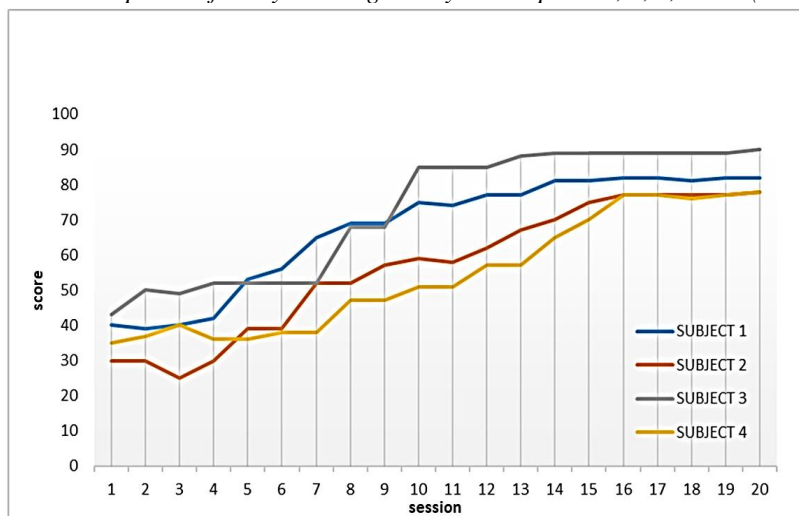
Figure 3
The Development of Spelling Ability Participants 1, 2, 3, and 4 (ABA Design)

As has been done by many teachers in the field, the reading process is carried out directly on reading syllables and words, so that if this is experienced by dyslexic students who clearly experienced obstacles in phonology, they will

experience difficulties in understanding teaching reading and will not increase in reading skills.

In addition, the preparation of material in the phonological instruction is made based on considerations in fulfilling the elements of blending,

segmenting, deleting, addition, substitution, and isolation of words, syllables, and phonemes. All of these things are the basics of the ability to manipulate sound as basic ability to decode reading activities.

Phonological instruction in increasing student's phonological awareness, reading skills, and speech in the selection has stages, materials, approaches, methods, and media that are specially designed to achieve the goals. This success in phonological instruction cannot be separated from how the teacher understands the stages of intervention being carried out.

Based on the results of the phonological instruction intervention applied to the four dyslexic students, it was found that the phonological instruction intervention had a positive effect on the raising of phonological awareness skills, reading and spelling skills. Thus, phonological instruction can be recommended for teaching staff or educators to be applied in teaching institutions. Teachers who are key to the success of students must be open and learn new things as well as optimize the abilities of students. In understanding and applying phonological instruction, tailored and in-depth training is needed to gain specific knowledge and experience on how to apply phonological instruction.

The findings of this study show that it is very important for dyslexic students to get phonological instruction because they agree with the opinion of experts that phonological teaching has an impact on reading ability (Berninger & Wolf, 2009) and spelling. The relationship between phonological awareness and reading ability is reciprocal and two-way. As phonological awareness develops, reading skills increase and vice versa (Dai et al., 2016; Layes et al., 2020; Mather & Wendling, 2012; Peters et al., 2019; Pfost et al., 2019; Snellings et al., 2009; Wang, 2017).

CONCLUSION

Overall, the findings from this study suggest that students with reading difficulties benefit from phonological instruction interventions and represent a key to effective reading interventions for students with reading difficulties. Based on several research results regarding the relationship between phonological awareness and reading, the key to reading intervention must involve areas of linguistic awareness, including phonological awareness.

There are several shortcomings of this study due to the limited time available. One of them is that this study was only tested on a limited scale on four research participants. This phonological instruction has not been tested extensively so it cannot be generalized. Therefore, it can be recommended to future researchers conduct a test extensively.

Throughout the research process, several new things were found that could be used as additional research findings, but not all of them were reviewed and answered in this study. One of them is RAN (Rapid Automatic Naming) which is a predictor of difficulty in reading besides phonological awareness (Snowling et al., 2019). Apart from phonological awareness, RAN has been identified as a cause related to dyslexia. In fact, RAN and phonological awareness were identified as two main factors in the double-deficit theory of dyslexia (Wolf, 2014). An individual may have problems in one or both of them this area which has an impact on reading skill development. Phonological deficits have a stronger relationship with decoding accuracy, whereas naming speed is more related to reading fluency (Araújo et al., 2015; Georgiou et al., 2016; Torppa et al., 2017).

In this study, RAN has not become the main focus yet, because it is limited to the beginnings of reading that do not require speed reading. This study only specifically limits the aspects of phonological instruction as an effort to increase the ability of phonological awareness, pre-reading, and spelling and has not involved NAP in the intervention process. Therefore, it is necessary to carry out further research so that things that have not been answered in this study can be used as recommendations for further researches.

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