Music Therapy for the Rehabilitation of Dyslexic Children

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Abstract:- Dyslexia is a learning disorder. A dyslexic has difficulties in reading, writing, spelling, and counting skills. They also encounter problems in recognizing the sound of letters. In Malaysia, there are several approaches used to help dyslexics with certain skills - these are multisensory as well as: auditory exercises using a computer, intervention programs, and rehabilitation programs. Multisensory and multimedia methods were more often used in conducting intervention programs for dyslexics in Malaysia. It is therefore the aim of this study to apply music therapy to help children with dyslexia using experimental research in the form of singing treatment. The purpose of this research was to test the effectiveness of singing treatment in improving the reading and writing skills of dyslexic children. Apart from that, this research also aims to improve the reading and writing skills of dyslexic children through singing treatment. This research was conducted at the Learning and Resources Centre of Dyslexia Association of Sarawak. Mixed method and One-Group Pretest-Posttest designs were applied to collected data. Four dyslexic children were selected to receive this treatment. They were named Subjects A, B, C, and D. Furthermore, they were divided into two groups:- Subjects A and B have a basic phonics ability and so were grouped together, whereas; Subjects C and D were grouped together as they do not have a basic phonics ability. The results show that this treatment was effective in improving the reading and writing skills of Subjects C and D. The t-value for this group is 1.40, which this value is below the significance level, 2.74. Besides that, this treatment was less effective in improving the reading and writing skills of Subjects A and B. The t-value for this group is 6.05, exceeding the significance level, 2.74.

I. INTRODUCTION

According to the Malaysian Dyslexia Association (n.d.), dyslexia is a type of disability where some parts of the brain fail to interpret written images into meaningful thinking. Dyslexia is a learning disability in which dyslexic individuals have difficulties in mastering spelling, reading, writing, and calculating skills (Zulikha Jamaludin et al, 2017). According to Aminah binti Kassim (2012), the intelligence of dyslexic individuals is normal. The objectives of this research were to 1. test the effectiveness of singing treatment in improving the reading and writing skills of dyslexic children and 2. improve the reading and writing skill of dyslexic children.

II. BACKGROUND

According to Jabatan Pendidikan Khas (2003 cited in Zulikha Jamaludin, Hafiza Abas, Husniza Husni & Faridah Hanim Yahya, 2017), there are three types of dyslexia:- visual dyslexia, auditory dyslexia, and auditory dyslexia. Individuals with visual dyslexia have difficulties in remembering and recognizing the shape of letters or words. They have difficulties in translating the symbols of printed or written words. Individuals with auditory dyslexia struggle within remembering letter sounds. They also have problems in analyzing the sounds of syllables and; arranging as well as spelling out the syllables of words. Individuals with visual and auditory dyslexia will face serious problems as this type of dyslexia is persistent.

The Malaysian Dyslexia Association has offered various types of programs such as intensive classes, annual activities; and other services, as well as numerous approaches and treatments to help dyslexic individuals in overcome their difficulties. In terms of treatment, dyslexic individuals receive suitable treatments according to their needs (Yuzaidey, Din, Ahmad, Ibrahim, Razak & Harun, 2008). Other approaches such as multisensory methods, phonological educational intervention, cognitive intervention, and cognitive skills training are frequently used abroad (Yuzaidey et al, 2018). In Malaysia, multisensory methods are regularly used in an intervention program to help dyslexic individuals (Yuzaidey et al., 2018).

Music therapy is an alternative modern treatment and is a professional field that uses music for rehabilitation, preservation and improvement for mental and physical status (Sharol, 2008 cited in Yasmin Hussain & Zainal Ariffin Ab. Ghani, 2013). There are two types of music therapy, active therapy and passive therapy (Yasmin Hussain & Zainal Ariffin Ab. Ghani, 2013). Active therapy involves individuals playing an instrument during the therapy session, whereas- passive therapy requires individuals to listen to music. According to Gfeller dan Davis (2008), a therapy session included five processes, references, evaluation, treatment planning, documentation of progress, and termination of treatment (Gfeller dan Davis, 2008 cited in Wheeler, 2015).

This study aims to apply music therapy to improve the reading and writing skills of dyslexic children; using passive therapy, where dyslexic children sing along to songs.

➢ *Literature*

Dyslexic individuals have weaknesses in processing speed, short-term memory, sequencing, hearing as well as visual perception, spoken language, and motor skills (Peer dan Reid, 2001). Factors that affect the speed of processing include the development of myelin sheaths in transmitting the information through nerves, the magnitude of synaptic gaps between nerves, the balances and effectiveness of neurotransmitter in the brain, as well as the efficiency of frontal lobes in organizing and directing information (Adubasim, 2018). Dyslexic individuals also have a poor working memory (Grant, 2005). Weak working memory causes dyslexic individuals to struggle with remembering and repeating information quickly (Alloway, 2006).

There are three ways to helping dyslexic individuals, namely, assessment, treatment and special therapy (Tammasses & Jumraini T, 2017).

For assessment, Oviedo & Gonzalez (2013) conducted a case study in Spain involving a boy named Pedro. Pedro has weaknesses in oral language as well as in the reading and spelling of words. In this study, Oviedo & Gonzalez (2013) designed an intervention program called the "Personalized reading and writing recovery" program for Pedro. As a result, he can read text fluently and there is an increase in his confidence.

For treatment, Ambrose &Loh (2011) conducted a case study in Malaysia on three students who had difficultiesin reading, could hardly identify words and could not distinguish between the letters "b", "d", "p" and "q". This investigator used a clay modeling programin this study. As a result, the students were not only able to read a particular text fluently and spell words correctly, but they were also able to focus in class, and their confidence increased.

For specific therapy, Katsarou (2017) conducted music intervention therapy in Greece, Thessaloniki; with 24 dyslexic students. The activities included were memory-melody, vocabulary learning and phonemic awareness. The result of this studywas that the students had improvements in linguistic skills, as well as the ability to recall words or sentences learned in songs.

III. METHODOLOGY

Quantitative and qualitative methods was used to collect data. For qualitative methods, in-depth interviews and observations through engagement was conducted to gather relevant information. For quantitative methods, a questionnaire was distributed during the treatment. T-testswere used to analyze the results of the four dyslexic children. Singing treatment was carried out during the therapy sessions. There were 20 sessions for this treatment. Two sessions were conducted for Subject A, B, C, and D each week, and each session lasted 30 minutes.

Pre-experimental designs were adapted in this research. On-group pretest-posttest designs were applied to collected data. The purpose of the pre-test was to compare both the experimental group and the control group before treatment, whereas the post-test allows the researcher to determine the effect of the treatment on the variables (Roger &Revesz, 2019). Figure 1 shows the notation system by Campbell & Stanley (1963), where- X represents the group that was exposed to the experiment, and; O refers to the process of observation. The order from left-to-right indicates the temporal arrangement.

$$O_1 \qquad X \qquad O_2$$

Fig 1 : Notation system for the one-group pretest-posttest design

Table 1. and 1. refer to the letters and words that were selected and were arranged according to the session and the level of difficulty. According to a teacher from the learning center, there are two children with basic phonic ability, and the other two do not have basic phonics ability.

Sessions	Letters/word	Sessions	Letters/word
1	Pre-Test	11	*betul*
2	*'a' & 'e'*	12	*kebab*
3	*'i' & 'o'*	13	*buaya*
4	*'u'*	14	*balik*
5	*mata*	15	*janji*
6	*batu*	16	*geram*
7	*susu*	17	*waris*
8	*muka*	18	*zahir*
9	*satu*	19	*fitnah*
10	*adik*	20	Post-Test

Table 1 :- table of letters and words for dyslexic children with basic phonic ability.

Sessions	Letters/word	Sessions	Letters/word
1	Pre-Test	11	*sayu*
2	*'a' & 'e'*	12	*bantu*
3	*'i' & 'o'*	13	*bumi*
4	*'u'*	14	*kuda*
5	*mata*	15	*luka*
6	*batu*	16	*beli*
7	*susu*	17	*bapa*
8	*muka*	18	*jari*
9	*satu*	19	*adik*
10	*kayu*	20	Post-Test

Table 2 :- Table of letters and words for dyslexic children with no basic phonic ability.

Homogeneous purposive sampling was used in this study. Four dyslexic children in the age range of 5 to 9 years old were selected to receive this singing treatment. These four dyslexic children have the same features of mirror-image writing and the inability to read- and were named Subjects A, B, C, and D. Subjects A and B have a basic phonic ability, whe are as Subjects C and D do not have basic phonic ability. Malay words were chosen as material for this treatment. The selected material already existed in the learning center. For the songs, researcher chose

fivefamiliar children tunes - baby shark, twinkle twinkle little star, london bridge is falling down, *lompatsikataklompat*and *bapakupulangdarikota*. By using purposive sampling method, only three tunes were selected out of the five tunes - twinkle twinkle little star, London bridge is falling down and *bapakupulangdarikota*. These three songs are in major key and have a fun, easy as well as interesting rhythm, to sing. These songs were arranged to sound more fun and interesting to sing for dyslexic children.

IV. RESULTS AND DISCUSSION

A scoring system was applied in evaluating the results of these four dyslexic children. The scores obtained by the children were the result of the researcher's interpretation through observation while being involved in the treatment sessions. Table 3 shows the average scores of reading and writing for both groups.

Groups	Subject	Reading		Total average scores	Writing		Total average scores
		Pre-test	**Post-test**		**Pre-test**	**Post-test**	
Does not have phonetic basis	A	608.17	879	1487.17	587.33	640	1227.33
	B	790.50	980	1770.5	869.17	860.50	1729.67
Have phonetic basis	C	981.50	1000	1981.5	924.92	926	1850.92
	D	1000	995	1995	971.84	930	1901.84

Table 3 :- Total average scores for reading and writing obtained by these two groups.

The total average scores for reading obtained by Subject A was 1487.17, while that of writing was 1227.33. Subject B acquired 1770.50 for reading and 1729.67 for writing. X_a represents the mean of reading while X_b represents the mean of writing. The calculation of the means for reading and writing for both Subjects A and B is shown below :

X_a = Mean of reading

X_a Subject A $= \frac{1487.14}{10}$ X_a Subject B $= \frac{1770.50}{10}$

$= \frac{148.72}{2}$ $= \frac{177.1}{2}$

$= 74.36$ $= 88.53$

X_b = Mean of writing

X_b Subject A $= \frac{1227.33}{10}$ X_b Subject B $= \frac{1729.67}{10}$

$= \frac{122.73}{2}$ $= \frac{172.97}{2}$

$= 61.37$ $= 86.48$

The calculation of the T-tests are shownbelow. The symbol for mean differences is MD, while that of the t value is *t*. N represents the total number of subjects involved in this treatment.

Subjek	X_a	X_b	$D = (X_a - X_b)$	$d = (D - MD)$	d^2
A	74.36	61.37	13.00	5.40	29.16
B	88.53	86.48	2.05	-5.55	30.80
N = 2	$\sum X_a$ =162.89	$\sum X_b$ =147.85	$\sum D$ =15.10	$\sum d$ = 10.95	$\sum d^2$ = 59.96

$MD = \frac{\sum D}{N}$ $t = \frac{MD}{\sqrt{\frac{\sum d^2}{N(N-1)}}}$

$= \frac{15.10}{2}$ $= \frac{7.60}{\sqrt{\frac{59.96}{2(2-1)}}}$

$= 7.60$ $= \frac{7.60}{\sqrt{29.98}}$

$= \frac{7.60}{5.46}$

$= 1.40$

The *t* value for this group is 1.40. The *t*value obtained by this group is under the significance level, 2.74. Therefore, this singing treatment was significantin affecting the reading and writing abilities of Subjects A and B who do not have a basic phonic ability.

For the group that does have abasic phonic ability, the total average score for reading obtained by Subject C was 1981.5, while writing was 1850.92. Subject D acquired 1995 for reading and 1901.84 for writing. X_a represents the mean for reading while X_b represents the mean for writing. The calculation of the means of reading and writing for both Subjects C and D is shown below :

X_a = Mean of reading

X_a Subject C $= \frac{1981.5}{10}$ X_a Subject D $= \frac{1995}{10}$

$= \frac{198.15}{2}$ $= \frac{199.5}{2}$

$= 99.10$ $= 99.80$

X_b = Mean for writing

X_b Subject C $= \frac{1850.92}{10}$ X_b Subject D $= \frac{1901.84}{10}$

$= \frac{185.10}{2}$ $= \frac{190.20}{2}$

$= 92.55$ $= 95.10$

The calculation of T-tests are shown below. The symbol for mean difference is MD, while that of the t value is t. N represents the total number of subjects involved in this treatment.

Subject	$\square_\square$	$\square_\square$	$\square = (\square_\square - \square_\square)$	$\square = (\square - \square\square)$	$\square^2$
C	99.10	92.55	6.55	0.92	0.85
D	99.80	95.10	4.70	-0.93	0.86
N = 2	$\sum\square_\square$ =198.90	$\sum\square_\square$ =187.65	$\sum\square$ =11.25	$\sum\square$ = -0.01	$\sum\square^2$ = 1.71

$\square\square = \frac{\sum\square}{\square}$ $\square = \frac{\square\square}{\sqrt{\frac{\sum\square^2}{\square(\square-1)}}}$

$= \frac{11.25}{2}$ $= \frac{5.63}{\sqrt{\frac{1.71}{2(2-1)}}}$

$= 5.63$ $= \frac{5.63}{\sqrt{0.86}}$

$= \frac{5.63}{0.93}$

$= 6.05$

The t value for this group is 6.05. The t value obtained by this group was over the significance level, 2.74. Therefore, this singing treatment was less effective in affecting the reading and writing abilities of Subjects C and D who have a basic phonic ability.

Three teachers who were the Malay Language teachers of the four dyslexic children were interviewed for more information. They are referred to here as Teacher X, Y and Z. These teachers reported insignificant changes in Subjects A, B, C, and D after receiving the singing treatment. This might be because the treatment sessions only happened twice a week and so were not enough to have a lasting effect. Apart from that, the dyslexic children had their treatment sessions while physically attending their existing tuition classes and intervention programs. Therefore, their learning outcomes could not be tracked effectively. In addition, the material used for the treatment sessions were the same as those used in the intervention programs and tuition classes, possibly causing confusion. Furthermore, these four dyslexic children do not have a good memory and easily forget what they learn. On the other hand, according to Teacher Z, music therapy was able to increase the child's confidence. She explained that- this treatment session requires dyslexic children to sing, and not all children are prepared to sing in front of people. Thus, music therapy might be able to grow one's confidence. Besides that, because these same four dyslexic children that attended therapy- also attended their intervention and tuition classes - the teachers report that the children often experience confusion from the differing approaches used in the treatment sessions- and those used in their intervention and tuition classes. The teachers also explained that, if the treatment session and tuition classes were conducted separately, then the results for the treatment can be reviewed more clearly.

The objective of this research was to test the effectiveness of singing treatment on the reading and writing skills of four dyslexic children. The results show that the singing treatment was effective on Subjects A and B but was less effective on Subjects C and D. Throughout the sessions, Subjects A and B easily forgot the letters and words they already learned. The researcher concludes that- Subjects A and B have poor working memories. There are two possible causes: the information received may not be stored in the hippocampus, or they might have weak synaptic plasticity. Due to their poor working memory, it is likely that the improvement in reading skills of Subjects A and B are not significant.

Based on the average reading scores, Subjects C and D show that they have a good working memory. They can recognize the sound of letters correctly and can combine syllables into one word. Although they are slow in spelling out the letters, they were able to pronounce letters and words accurately, possibly only indicating a slow processing speed.

The total average writing scores were inconsistent throughout the treatment sessions. These four dyslexic children were able to write letters and words but some of them write letters in an inverted position, write letters incorrectly or write untidily. Some of them were able to write letters and words correctly with instruction from the teacher, but the others are not able to. They possibly tend to write letters or words incorrectly due to the basal ganglia and cerebellum not being able to store the information received by the brain. The basal ganglia and cerebellum are very important in coordinating motor activity and controlling one's fine motor skills, which would explain why dyslexic children are not able to write letters accurately.

V. CONCLUSION

In conclusion, the main objective of this research in testing the effectiveness of singing treatment in dyslexic children was not achieved. This singing treatment was effective on Subjects A and B, both of whom do not have a basic phonic ability. This singing treatment was less effective on Subjects C and D, who both have a basic phonic ability. Apart from that, the second objective of this research,

which was, to improve reading and writing skills of dyslexic children through singing treatment was achieved. Although their improvement is static and less clear, they indirectly received a little bit of learning from this singing treatment.

This study only involved four dyslexic children receiving this singing treatment, and thus doe not in any way attempt to be representative of all dyslexic children.

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