
| RESEARCH ARTICLE

The Impact of Multisensory Stimulation of Biological Organs in Dysarthria Patients as Articulation Skills Rehabilitation

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| ABSTRACT

Every human being tries to communicate what he wants to say to whatever or whomever he wants. Dysarthria is a condition in which the muscles in humans that are active when speaking become weak or difficult to control. Problems or speech disorders experienced by a child with dysarthria are obstacles to children's social and personal adjustment. Schoolchildren who mispronounce the words will feel ashamed and alien from others. This problem motivates the presence of Multisensory Stimulation therapy to help improve and even restore speech problems or disorders experienced by children with dysarthria. This study tries to explain the impact of Multisensory Stimulation therapy and then evaluates the results of the application of Multisensory Stimulation therapy to children with dysarthria. The study that took five sufferers as the object of this study used a hybrid approach that mutually used a qualitative and quantitative perspective. The type of research used is classroom action research. This study concluded that the participants' enthusiasm greatly influenced the process and outcome of therapy.

| KEYWORDS

Dysarthria, Multisensory Stimulation, Biological organs, Articulation Skills

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1. Introduction

Every human being tries to communicate what he wants to convey to whoever he wants. Whatever the situation, the desire to convey the message will always be tried to the maximum. The problem is how things arise in situations that are not ideal, either from the articulators, auditors, or acoustic media. In order to communicate and interact well, every human being must use good language as well. Every human being must have a good language and speaking function. If the regulating function of language and speech, namely the brain and speech apparatus, is not good or not average. It will also disrupt the production of language and speech (Indriati, 2011, p. 22).

Children with dysarthria are also ordinary people who still desire to communicate and be understood by others. Of course, the conditions and shortcomings that they experience are a challenge for themselves or others who interact with them.

A speech problem or disorder experienced by a child is an obstacle to the child's social and personal adjustment. Schoolchildren who mispronounce the words will feel ashamed and alien from others.

A child with a speech disorder may find it difficult or shy to communicate with peers or teachers. As a result, the child avoids asking questions, is reluctant to participate in discussions, or avoids communicating with peers (Santrock, 2011, p. 262).

This problem requires a speech therapy system that can help improve and even restore speech problems or disorders experienced by children with dysarthria. One of the methods offered is Multisensory Stimulation therapy.

Multisensory Stimulation Therapy is a therapeutic method that optimizes the tactile, vestibular, and proprioceptive sense systems. Although these three sensory systems are not very familiar compared to other senses, they are essential because they help children's interpretation and response to the environment (Siregar, 2016, p. 33).

This study tries to explain the impact of Multisensory Stimulation therapy and then evaluates the results of the application of Multisensory Stimulation therapy to children with dysarthria. Children who are the object of research have poor language skills, making it challenging to communicate with other people who do not master sign or oral language. Lack of language skills such as soft articulation skills in the formation of consonants significantly affects the pronunciation of a word.

New research is worth doing if it touches at least one of these two traits: urgent and interesting (Siregar et al., 2021, p. 51). The purpose of this study was to provide an objective exposition and evaluation of the impact of applying Multisensory Stimulation therapy. This variable is important because this type of therapy is a therapy that has additions and reductions in terms of methods and techniques, although it is a development of conventional therapies. All of this is dedicated to the good of Dysarthria sufferers and those who interact with them.

2. Literature Reviews

The condition of the human brain determines a person's language ability. If there is a disturbance or damage to the brain, it will undoubtedly affect speaking ability (Johan, 2018, p. 114). In general, there are four types of brain disorders in certain parts, namely: aphasia, agnosia, apraxia, and dysarthria.

Language disorders have several causes that are certainly different for each person. According to Ahmadi (2015, p.145), language disorders are divided into two factors or causes. The first factor due to language disorders is medical, and the second is social environmental factors.

Dysarthria is a condition in which the muscles in humans that are active when speaking become weak or difficult to control. These muscles include the muscles of the lips, tongue, vocal cords, and diaphragm (Mujiyanto, 2018). According to Dharmaperwira (2000: 5), dysarthria is a speech disorder caused by neuromuscular injury (the connection formed by contact between motor neurons and muscle fibers). An injury causes this injury to the central nervous system, which of course, affects the proper functioning of one or several muscles needed for speech activities. Dysarthria disorders have the exact cause but attack different places. This situation can undoubtedly classify dysarthria disorders according to the type and cause.

The brain as the center of movement of the body is vital and very vulnerable to its existence. Because if there is damage to the brain, the body cannot work optimally. Brain injury occurs due to abnormalities in blood vessels (Satyanegara, 2013). The patient experiences paralysis of the right half of the body. This condition is because the control of the muscles in some parts of the body is damaged. That makes the muscle work becomes unbalanced. Paralysis will affect vision and memory performance, even in digesting food.

Impaired nerve function will be damaged when the blood flow to the brain drops and oxygen is lacking in the brain. If this happens, the brain tissue function has not died, but there is a disturbance in its functioning. If the interruption of blood flow continues, nerve tissue death will occur. In hemorrhagic stroke found increased pressure in the skull due to the addition of blood. High pressure in the skull can be fatal. Some of the causes that attack the brain include:

a. stroke

Stroke is usually defined as a disease that makes a person paralyzed. A stroke is an attack on the brain. It occurs due to a lack of oxygen, and anyone can have a stroke. Usually, many adults have strokes. However, this can also happen to young people. A stroke is a sudden damage to nerve function due to not smooth blood circulation to the brain. This condition occurs because blood vessels in the brain are blocked or burst. The brain should get enough oxygen. If not, it will inhibit, and the brain will lack oxygen which causes nerve cell death (Pinzon, 2010, p. 1).

There are two kinds of strokes. First, stroke is a blockage caused by a blockage in the blood vessels leading to the brain. The second is a hemorrhagic stroke caused by the rupture of a blood vessel leading to the brain. Both types of stroke can cause a lack of oxygen to the brain, which causes the nerve tissue to die. Based on the location of the blood vessels, hemorrhagic stroke is divided into two. The first that occurs in the brain tissue is an intracerebral hemorrhagic stroke, and the second that occurs under the tissue covering the brain is called a subarachnoid hemorrhagic stroke. This condition causes after a person has a stroke to experience aphasia (Pinzon, 2010, p. 2).

b. Head Bump

For someone who accidentally gets into an accident, the part that is most prone to injury is the head. Even though the skull protects the brain and outside the skull, skin and hair are covering it, it is possible for injuries to the head and brain to occur; the injuries can be minor or fatal afterwards. This collision is often experienced by people who play ball. After hitting the ball on the head, even though the ball is not hard, the force that makes the ball thrown can cause a person to feel spinning and head hurts, even fainting. After a minor injury, there will be marked loss of neurological function and no structural damage. Commotion usually includes a period of unconsciousness that lasts for a few seconds or even a few minutes, this state will feel the symptoms of dizziness, and complete loss of consciousness occurs (Batticaca, 2008, p. 97).

A collision to the head is often considered trivial. For example, when the head hits a door, wall, table, or other blunt objects, it can result in minor injuries that can be a significant and severe injury if later hit again. If the condition is just a non-serious bruise, the bruise will heal a few days after the impact, but bleeding inside can trigger a person to develop aphasia. According to Batticaca (2008: 98), when a person experiences a severe head injury, his brain is bruised, and the affected area will bleed. A person who has been seriously injured is unconscious, has a weak pulse, shortness of breath, pale skin, and subnormal blood pressure and temperature. Do not underestimate the head hit by a blunt object.

c. Infection

Infections that can cause a person to experience aphasia are bacterial meningitis caused by Infection of the meninges. According to Ginsberg (2005, p. 122), there are three organisms in epidemics: *Neisseria meningitidis*. The second is *Haemophilus influenzae*, which often attacks children and even adults, and the third is *Streptococcus pneumoniae*, which occurs in the elderly and is associated with alcohol. This Infection spreads to the meninges from adjacent structures (ears) or the lungs via the bloodstream.

Brain degeneration results from the loss of one or more brain components, such as metabolic, toxic, and hereditary diseases. A form of brain atrophy, namely generalized brain atrophy, occurs in the ageing process or Alzheimer's disease, viral infections, and poisoning. Cerebellar atrophy includes the brain stem and focal brain atrophy that occurs due to the effects of residual brain trauma or vascular insufficiency (Satyanegara, 2013, p. 115).

d. Tumor

Grades of brain tumors are divided into grades one to four. This classification is based on the nature of the tumor, such as the speed of spread. Brain tumors that are benign and non-malignant are ranked one and two, then tumors that can become cancer are ranked three and four. According to Satyanegara (2013, p. 263), the first type of tumor is glioma in the connective tissue between nerve cells and fibers and spinal nerves. Second, meningiomas, these tumors are in the membrane that protects the brain and spinal cord. Third, hemangioma, a tumor located in the blood vessels of the brain, this tumor can cause partial paralysis and convulsions, which are very susceptible to aphasia. Fourth, acoustic neuroma, a tumor located on the acoustic nerve that helps control the balance of a person's body. Furthermore, fifth, pituitary adenoma, a small gland located in the lower area of the brain, this tumor is benign but affects hormone effects throughout the body.

Many variables influence symptoms of a brain tumor that appear. There are the size, speed of growth, and the presence of the tumor. Initially, there are no symptoms in slow-growing tumors, but the tumor will appear with seizures and headaches as they enlarge. Tumors that are in certain places can interfere with the nervous system. The cause of the tumor is still not solved. Some of the factors suspected as the cause are heredity and radiotherapy's after-effects. They can increase the risk of tumors. Many factors can increase the risk of developing brain tumors that the public is not widely realized.

Multisensory Stimulation Therapy is a therapeutic method that optimizes the tactile, vestibular, and proprioceptive sense systems to rehabilitate chemical systems and human biological organs (Siregar, 2016, p. 25). This type of therapy acts as a stimulator of the vital senses in humans, incredibly tactile, vestibular, and proprioceptive. Although these three sensory systems are not very familiar compared to other senses, they are vital because they help children's interpretation and response to the environment (Siregar, 2016, p. 33).

Multisensory therapy is an attempt to engineer the condition of the human brain through stimulation of its biological organs. The human brain has human parts. This variable is related to the hearing apparatus, speech, controlling speech apparatus, and so on, while in the animal brain, it is mainly related to instinct (Kirana & Sulisty, 2018).

Skill means developing the knowledge gained through training, practice, and experience by carrying out several tasks as a development activity (P. Robinson & Timanthy A. Judge 2009, p. 57). Skills are individual skills to do or apply something. Skills in Bloom's taxonomy occupy the psychomotor domain (Nasution, 2010, p. 25).

There are many potential causes of articulation disorders. Among the causes of articulation disorders, according to Mohammad Efendi (1995, p. 45), are as follows:

A. Organic Factor

- a) Loss of sharpness of the sense of hearing.
- b) The physical constitution of the mouth and face (oral-facial) that is lacking or imperfect.
- c) Poor coordination of the muscles of speech.
- d) High or narrow palate makes it difficult for the tongue to move.

B. Functional Factors.

- a) Inconsistent or wrong teaching methods from parents in discussing speech stimulation in children.
- b) Poor speech model applied in the home environment, the surrounding environment, and the school environment.

3. Research methods

A researcher should find the most effective and efficient method to achieve the research objectives (Siregar, 2021, p. 7). This research uses a hybrid approach that uses qualitative and quantitative perspectives mutually. The type of research used is classroom action research. According to Kunandar (2008, p. 45), classroom action research intends to improve the quality of classroom learning practices. This opinion is supported by Kasihan Kasbolah, who states that classroom action research is "action research in the field of education carried out in the classroom area intending to improve and or improve the quality of learning (Luthfi Diah AW 2015, p. 36)." Meanwhile, according to Herawati Susilo et al. (2009, p. 1), *classroom action research* is also defined as a process of controlled, recycled, and self-reflective investigation carried out by teachers/prospective teachers to make improvements to the system, way of working, content, competence, or learning situation.

In observation and analysis, each data is presented by recording objective documentation and then analyzed with a comprehensive perspective according to research needs. This technic is an effective and efficient step to achieve the research objectives.

The design used in this study is the design developed by Kemmis and McTaggart (Suharsimi Arikunto, 2010, p. 131). This design is in the form of a cycle. In each cycle, there are four stages or steps. These stages include planning (planning), action (acting), observation (observing), and reflection (reflecting).

This study took five patients as the object of research. The choice of research object was carried out randomly according to the willingness of the patient, his family, and the care institution. All ethical requirements for research involving humans as research objects have also been met and presented before the research is carried out.

The test used is a learning outcome test. The learning outcomes test that will be used in this study is a test made by the researcher. The learning outcomes test was made to measure the object's ability before and after the action, consisting of 20 action test questions.

Scoring is based on achievement indicators in the scoring system as follows:

1. Score 5: if the object can respond to the test clearly and correct the voice.
2. Score 4: if students can respond to the test through repetition and clear voice.
3. Score 3: if students can respond to the test with a reduction or addition of letters and clear sounds.
4. Score 2: if students can respond to the test with doubt, the voice is unclear.
5. Score 1: if the student cannot respond to the test and the voice is unclear.

The learning result score is converted into a value or achievement in the form of a percentage using the following formula:

$$P = R/ZS \times 100\%$$

Description:

P = Percentage of object's skills in articulation skills

R= Student articulation skill score

ZS= The maximum score adjusted for the given score.

The achievement value derived from the therapy result test can then be identified with the predicate of learning achievement using the assessment guide table below.

4. Results and Discussion

This study finds and exposes dysarthria cases into several classifications. The classifications include:

- A. Lower motor neuron (Euro muscular) dysarthria, weakness or paralysis of the muscles of articulation, Prolonged damage to the tongue shrivelling and fasciculations on the floor of the mouth, weak and quivering lips, Saliva collects in the mouth due to dysphagia and drooling, Dysphonia: paralysis vocal cords, Unclear speech: difficulty speaking vibrates like r, Complete paralysis, tongue and lip consonants cannot be pronounced ultimately, Nose sounds, Bilateral lip paralysis affects the pronunciation of labial consonants; 'p and b' become indistinct & sound like 'f and v.'
- B. Spastic (Pseudobulbar) dysarthria, has bilateral weakness of the lips, jaw, tongue, palate, pharynx, & larynx has a characteristic speech disorder, speech is slow, slurred, unnatural & stiff, jaw twitching and related to emotional control, possibly experiencing cerebribilateral cerebral circulatory disease.
- C. Rigid (Extrapyramidal) dysarthria, articulation disorder characterized by rapid muttering and speech confusion, obscure words and syllables, low and monotonous voice, lack of tone of voice, lower volume at the end of sentences, words spoken in a hurry.
- D. Ataxic dysarthria, drugs that affect the function of the cerebellum (alcohol, anti-seizure), the symptoms are slow, broken, monotonous speech, and improper word separation, impaired speech coordination & respiration, breathing is not enough to say words or syllables.
- E. Hypokinetic dysarthria, difficulty starting, continuing, and stopping movement, speech movements are slow, sometimes fast, flat tone with decreased intensity and monotonous.
- F. Hyperkinetic dysarthria, about the cause, involuntary movements can be slow or fast, rhythmic or dysrhythmic, covering the whole body or limited to a single structure such as the jaw, affecting sound production, articulation is not appropriate, speech flow disturbances such as hesitating, voice quality such as choking.

Each case in this classification was given a similar treatment according to the technique and strategy of Multisensory Stimulation therapy. However, several steps are often reduced or added to achieve research effectiveness and efficiency.

As we know, humans are equipped with five senses, namely the senses of sight, hearing, touch, taste, and smell. Nevertheless, two other senses are also vital: the vestibular sense (balance) and the proprioceptive (movement).

Before explaining the research results, it is also necessary to describe the findings related to multisensory disorders in patients with dysarthria, who are the object of this study. This step is helpful as a reference and a holistic perception to read this research's direction, results, and conclusions.

The first disturbance occurs in the tactile sense. Tactile provides information about pressure, temperature, and pain to a person through what is touched and what is touched.

Tactile is the enormous sense possessed by humans because receptors are from the tip of the hair to the tip of the human toe. The presence of disturbances in tactile will cause misperception of the information provided through touch.

There are three sensory disturbances: hypersensitivity, hyposensitivity, and seeking. If a child is hypersensitive to tactile, the child tends not to like being touched, avoids touching, refuses to eat food with certain textures, refuses to wear clothes from certain materials, interfering with the development process.

If a child is hypersensitive, it is dangerous for the child. Why? If a child has a deficient level of sensitivity to temperature, for example, a child can lightly touch a hot pan, but he does not feel the heat, this can be fatal, namely burns to the child.

The next disturbance is in the vestibular sense. The Vestibular is located in the inner ear. However, this sensory system is very influential on the balance of the human body, gravity, and movement. The vestibular is responsible for maintaining a person's balance when moving.

Someone who has a disturbance in this sensory system, hypersensitivity, can be afraid of simple movements, such as climbing a swing, refusing to be carried, afraid of taking elevators, escalators and often feeling anxious.

Meanwhile, someone who is hyposensitive is usually less aware of the sensation of falling, so they do not take protective actions such as holding themselves with their hands, so they do not hit them.

The next disturbance is in the proprioceptive sense. Proprioception is responsible for body awareness, providing information about the position of the limbs, a person's position in the environment, and the amount of force that needs to be expended to perform a movement.

Delicate motor tasks such as writing, eating, buttoning a shirt depending on an efficient proprioceptive system. If someone has a sensory system disorder, a person will find it difficult to know how much finger muscle strength is needed to hold a pencil. Whether very strong or very weak, one could not tell the difference.

According to the therapeutic process, the steps that are observed and used as a reference for data collection are limited to the following stages:

A. Observing

- a. Using the sense of sight to read lips, see writing through picture cards and the teacher's writing, and the child can say words from the word/picture cards shown by the teacher.
- b. Optimizing the sense of hearing to hear while optimizing the sense of sight in observing lip movements, then the child says the words he hears from the teacher while seeing the teacher's lips move.
- c. Optimizing the sense of hearing to hear the words spoken by the teacher without reading lips, and the child can say the words he hears without seeing the teacher's lips move.
- d. Say the word according to the teacher's example, and the child can repeat the word exemplified by the teacher.
- e. Optimizing the sense of touch to feel the vibration of the speech organ due to sound, for example, the cheek, neck, and chest area, then the child says the word according to the teacher's example while feeling the cheek, neck, and chest.
- f. Optimizing tactile to search for words with their fingers, then the child can say the word after tracing the word with their fingers.

B. Asking

- a. Motivate sufferers by asking about learning materials.
- b. Encourage sufferers to respond to answers to their questions.

C. Reasoning

- a. Directs the patient to analyze the words spoken by the interlocutor.
- b. Directs the patient to analyze the articulation of the interlocutor when pronouncing words.

D. Try

- a. Guiding students to carry out exercises according to the existing work stages and reminding students to record the results of the experiment.
- b. Guiding students to focus on practical activities.

After going through the therapy process, which was carried out for seven stages for 33 days, the research data emerged as illustrated in the following table:

No	Object	Pre-action test results	Post-action test results	Criteria
1	Boy - 10 years old	44%	45%	Increase 1%
2	Girl - 8 years old	51%	57%	Increase 6%
3	Boy - 8 years old	51%	54%	Increase 3%
4	Boy - 9 years old	49%	53%	Increase 4%
5	Girl - 7 years old	47%	50%	Increase 3%

Stage 2

No	Object	Pre-action test results	Post-action test results	Criteria
1	Boy - 10 years old	45%	46%	Increase 1%
2	Girl - 8 years old	57%	62%	Increase 5%
3	Boy - 8 years old	54%	57%	Increase 3%
4	Boy - 9 years old	53%	59%	Increase 6%
5	Girl - 7 years old	50%	53%	Increase 3%

Stage 3

No	Object	Pre-action test results	Post-action test results	Criteria
1	Boy - 10 years old	46%	49%	Increase 3%
2	Girl - 8 years old	62%	65%	Increase 3%
3	Boy - 8 years old	57%	57%	Unchanged 0%
4	Boy - 9 years old	59%	63%	Increase 4%
5	Girl - 7 years old	53%	59%	Increase 6%

Stage 4

No	Object	Pre-action test results	Post-action test results	Criteria
1	Boy - 10 years old	49%	55%	Increase 6%
2	Girl - 8 years old	65%	64%	Decrease 1%
3	Boy - 8 years old	57%	55%	Decrease 2%
4	Boy - 9 years old	63%	64%	Increase 1%
5	Girl - 7 years old	59%	60%	Increase 1%

Stage 5

No	Object	Pre-action test results	Post-action test results	Criteria
1	Boy - 10 years old	55%	56%	Increase 1%
2	Girl - 8 years old	64%	67%	Increase 3%
3	Boy - 8 years old	55%	57%	Increase 2%
4	Boy - 9 years old	64%	65%	Increase 1%
5	Girl - 7 years old	60%	62%	Increase 2%

Stage 6

No	Object	Pre-action test results	Post-action test results	Criteria
1	Boy - 10 years old	56%	61%	Increase 5%
2	Girl - 8 years old	67%	71%	Increase 4%
3	Boy - 8 years old	57%	60%	Increase 3%
4	Boy - 9 years old	65%	71%	Increase 6%
5	Girl - 7 years old	62%	68%	Increase 6%

Cumulative combined stage

No	Object	Pre-action test results	Post-action test results	Criteria
1	Boy - 10 years old	44%	61%	Increase 17%
2	Girl - 8 years old	51%	71%	Increase 20%
3	Boy - 8 years old	51%	60%	Increase 9%
4	Boy - 9 years old	49%	71%	Increase 12%
5	Girl - 7 years old	47%	68%	Increase 21%

Observations made by researchers during the learning activities that took place showed essential things as follows:

1. Objects 2 and 5 looked very enthusiastic about participating in the therapy process. Objects follow the entire learning sequence even though the two subjects fight over the same paper. Subject 2 often took the identification card belonging to subject 5, so the two subjects often joked and made a fuss during the lesson. These two objects often appear impatient and compete to start first when asked to pronounce consonant variables and stick cards before being given instructions by the therapist.
2. During the learning process, object 1 was initially confused about following the therapist's instructions, so that he was often late when sticking cards and got the last queue when he practised pronouncing the consonants in words listed on the cards. Object 1 was still confused when following the learning series at the first and second stage meetings. Meanwhile, the objects were very enthusiastic about playing puzzles and asking questions at the third and sixth meetings.
3. Object 5 is the most easily directed in learning. Object 5 also often helps the teacher when other objects have difficulty following instructions and improving pronunciation. Object 5 is very enthusiastic about participating in learning. Object 5 was able to follow instructions and speak words and string questions, although some errors still occurred. Object 5 also on its initiative to practice pronunciation during the grace period.
4. All objects experience saturation after meeting the 3rd stage. The enthusiasm for following the new therapy process emerged after revisions and material variations were carried out in the following stages. Revisions and variations made in principle only change the figure or place presented in the learning material. In contrast, the classification and orientation of the material were not changed or corrected at all.
5. All objects are seen to identify the therapist's sincerity and patience. In many cases, therapists who claim to be physically or mentally exhausted do not seem to respond positively to all objects. Although the way of speaking and gestures has been tried to be changed to be more gentle and pleasant, the objects still respond negatively to the interactions made by the therapists.
6. The 2 to 3-day lag between the stages of the meeting looks quite ideal and can maintain the enthusiasm of the therapy participants.

5. Conclusion

Based on the results and discussion of the research, it is concluded that Multisensory Stimulation therapy has a significant positive impact. Participants' enthusiasm (psychological problems) dramatically affects the process and results of therapy. Enthusiasm is challenged by the saturation of the therapy process itself. The conception and therapist's creativity dramatically determine the quality of the therapy process and the results. The accuracy of setting the frequency and intensity of time also dramatically determines the significance of the process and the results of the therapy itself.

This study ultimately recommends that Multisensory Stimulation therapy be used as a priority alternative in overcoming the rehabilitation problem of children with dysarthria. However, the development of strategies, tactics, and models of Multisensory Stimulation therapy also needs to be developed, actualized and coordinated according to the principles of effectiveness and efficiency. Once again, everything is dedicated to the good of the sufferer, their family, and all those who interact with them.

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References

- [1] Ahmadi, A. (2015). The foundations of psycholinguistics. Jakarta: The Achievement of the Jakarta Library. Aribowo, Luita. (2018). Neurolinguistics: Applying Linguistic Concepts and Theories. *Journal Language Description*. 01(1), 46.
- [2] Bambang S. S.PTh. (2000). Speech Therapy for Education and Health Practitioners. Jakarta: *Medical Book Publisher*
- [3] Bernadeta T. (2012). Speech Learning for Deaf Children. The results of the Bintel Development of Substances of the SLB Curriculum Materials for the Speech Development Program. Semarang: Department of Education and Culture of Central Java Province
- [4] Batticaca, F. (2008). Nursing Care of Clients with Nervous System Disorders. Jakarta: Salemba Medika.
- [5] Chaer, A. (2012). Psycholinguistics Theoretical Studies. Jakarta: Rineka Cipta.
- [6] Chaplin, J.P. (1997). Complete Dictionary of Psychology. Translator Kartini Kartono. Jakarta: Raja Grafindo Persada.
- [7] Dharmaperwira–Prins, R. (1985). Dysarthria – Verbal Apraxia and TEDYVA. Jakarta: Indomedika.
- [8] Daniel P. Hallahan, James M. Kauffman, and Paige C. P. (2009). Exceptional Learners: An Introduction to Special Education. USA: Pearson.
- [9] Dudung A and Moch. S. (1996). Speech Teaching Guidelines for Deaf Children. Jakarta: CV. Prosperous Works.
- [10] Edja S. & Dardjo S. (1995). Build Perception of Sound and Rhythm. Jakarta: Director General of Higher Education.
- [11] Endang S. (2003). Speech Pathology. Yogyakarta: Yogyakarta State University
- [12] Eriyanti, R. W. (2017). Coherence of Teacher Questions on Learning. TOUR: Journal Science of Language, Literature, and Its Teaching, 2(1), 77-89.
- [13] Ginsberd, L. (2005). Lecture Notes: Neurology. Translation by Indah Retno. 2007. Jakarta: Erlangga.
- [14] Herawati S. (2009). Classroom action research. Malang: Bayumedia Publishing.
- [15] Hurlock, and Elizabeth B. (2004). Developmental Psychology Jakarta: Erlangga.
- [16] Indah, R. (2017). Language Disorders Introductory Study. Malang: UIN-Maliki Press.
- [17] Indriati, E. (2011). Speech and Language Difficulties in Children: Parental Therapy and Strategies. Jakarta: Prenada.
- [18] Kirana, C., & Sulisty, E. T. (2018). Expressive Speech in Republican Political Humor
- [19] Kunandar. (2008). Easy Steps for Classroom Action Research as Teacher Professional Development. Jakarta: Rajawali Press.
- [20] Lucky A S. (2007). Effect of Multisensory Method in Improving Early Reading Ability in Kindergarten Children. Research Report. Semarang: Faculty of Psychology, Diponegoro University.
- [21] Lumbantobing, S. M. (2014). Clinical Neurology: Physical and Mental Examination. Jakarta: FKUI Publishing Agency.
- [22] Lutfi D. A. W (2015) Improving Articulation Skills Through the Peer Tutorial Method for Deaf Children in Elementary Grade IV at SLB Wiyata Bhakti Kulon Progo. Essay. Yogyakarta: Yogyakarta State University.
- [23] Marsono. (1993). phonetics. Yogyakarta: Gajah Mada University Nasution. (2010). Integrated Quality Management. Jakarta: Ghalia Indonesia.
- [24] Miftakhul H. (2014). Teaching and Learning Models. Yogyakarta: Student Library.
- [25] Mukhtar. Practical Methods of Qualitative Descriptive Research. Jakarta: Reference, 2013.
- [26] Mujianto, G. (2018). Analysis of Critical Discourse on Reporting About Islamic Organizations on Online News Sites. KEMBARA: Scientific Journal of Language, Literature, and Its Teaching, 4(2), 155-172.
- [27] Mujianto, G. (2018). Cohesion Tools in Written Discourse for Teachers of SMA/SMK Muhammadiyah Malang Regency KEMBARA: Scientific Journal of Language, Literature, and Their Teaching, 3(2), 210-233.
- [28] Mulyono A. (2003). Education for Children with Learning Disabilities. Jakarta: Rineka Cipta
- [29] Munawir Y. (2005). Education for children with learning problems. Jakarta: Ministry of National Education
- [30] Mohammad E. (2005). Introduction to Psychopedagogy of Children with Disabilities. Jakarta: Earth Literacy
- [31] Musaffak, M. (2015). Discourse Analysis of Food and Beverage Advertisements on Television Based on the Structure and Function of Language. KEMBARA: Scientific Journal of Language, Literature, and Its Teaching, 1(2), 224-232.
- [32] Ngali P. (2012). Teaching Evaluation Principles and Techniques. Bandung: PT. Remaja Rosdakarya
- [33] Nur I. D.M (2014). Improvement of Velar Consonant Pronunciation Ability Through VAKT Method in Taman 3 Class at Karnnamanohara Special School. Essay. Yogyakarta State University of Yogyakarta.
- [34] Pinzon, R. (2010). Beware Stroke! Definition, Symptoms, Action, Treatment & Prevention. Yogyakarta: Publisher Andi.
- [35] Robbins, S. P. and Judge, T. A., (2009). Organizational Behavior. 13th Edition. Pearson Education, Inc., Upper Saddle River, New Jersey.
- [36] Sabrina, A., Siregar, I., & Sosrohadi, S. (2021). Lingual Dominance and Symbolic Power in the Discourse of Using the PeduliLindungi Application as a Digital Payment Tool. *International Journal of Linguistics Studies*, 1(2), 52–59. <https://doi.org/10.32996/ijls.2021.1.2.8>
- [37] Salsabila, Siregar, I., & Sosrohadi, S. (2021). Analysis of Code Mixing in Jerome Polin Youtube Content “Nihongo Mantappu”. *International Journal of Linguistics, Literature and Translation*, 4(12), 01–08. <https://doi.org/10.32996/ijllt.2021.4.12.1>
- [38] Sardjono. (2005). Speech Therapy. Jakarta: Directorate General of Higher Education Suharsimi Arikunto. (2010). Research Procedures, A Practical Approach. Jakarta: Rineka Cipta.

- [39] Sastra, G. (2011). *Neurolinguistics: An Introduction*. Bandung: Alfabeta.
- [40] Satyanegara. (2013). *Neurosurgery*. Jakarta: Gramedia Pustaka Utama.
- [41] Santrock, John W. (2010). *Lifetime Development*, 5th Edition, Volume I. Jakarta: Erlangga.
- [42] Siregar, I., Rahmadiyah, F., & Siregar, A. F. Q. (2021). Therapeutic Communication Strategies in Nursing Process of Angry, Anxious, and Fearful Schizophrenic Patients. *British Journal of Nursing Studies*, 1(1), 13–19. <https://doi.org/10.32996/bjns.2021.1.1.3>
- [43] Siregar, I., Rahmadiyah, F., & Siregar, A. F. Q. (2021). Auditorium Model Assessment with Corrected Acoustic Function. *British Journal of Physics Studies*, 1(1), 01–06. Retrieved from <https://al-kindipublisher.com/index.php/bjps/article/view/2610>
- [44] Siregar, I. & Siregar, R. (2021). The Relevances between Poda Na Lima Philosophy with Islamic Perspective. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences*. <https://doi.org/10.33258/birci.v4i4.3240>
- [45] Siregar, I. & Salsabila. (2021). Acts of Illocutionary Speech by Ganjar Pranowo in the "One Hour Closer" Talkshow. *International Journal of Arts and Humanities Studies*, 1(1), 95–100. <https://doi.org/10.32996/ijahs.2021.1.1.14>
- [46] Siregar, I. & Sabrina, A. (2021). Representation of Religious Values in Gurindam Twelve and Their Relevances with Modern Era. *International Journal of Cultural and Religious Studies*, 1(1), 50–57. <https://doi.org/10.32996/ijcrs.2021.1.1.7>
- [47] Siregar, I. (2021). Verbal Communication of Schizophrenic Patients Due to Neurotransmitter Distortion. *QALAMUNA: Jurnal Pendidikan, Sosial, Dan Agama*, 13(2), 543–556.
- [48] Siregar, I. (2020). *Exploration and Implementation of the Cultural System as a Solution to National and State Problems*. <http://repository.unas.ac.id/id/eprint/811>
- [49] Siregar, I. (2021). Analysis of Betawi Language Interference on the Morphology of Adolescent Speech in Jakarta. *Journal of Humanities and Social Sciences Studies*, 3(8), 54–60. <http://doi.org/10.32996/jhsss.2021.3.8.7>
- [50] Siregar, I. (2020). *Geografi Leksikon Betawi*. Jakarta: LPU Unas
- [51] Siregar, I. (2021). Epistemological Challenges Against Sociolinguistics. *International Journal of Linguistics Studies*, 1(2), 37–42. <https://doi.org/10.32996/ijls.2021.1.2.6>
- [52] Siregar, I. (2021). The Existence of Culture in its Relevance to the Dynamics of Globalization: Bahasa Indonesia Case Study. *International Journal of Cultural and Religious Studies*, 1(1), 33–38. Retrieved from <https://www.al-kindipublisher.com/index.php/ijcrs/article/view/2285>
- [53] Siregar, I., Rahmadiyah, F., & Siregar, A. F. Q. (2021). Linguistic Intervention in Making Fiscal and Monetary Policy. *International Journal of Arts and Humanities Studies*, 1(1), 50–56. <https://doi.org/10.32996/ijahs.2021.1.1.8>
- [54] Siregar, I., (2021). *Research Methodology*. Jakarta: Uwais Inspirasi Indonesia
- [55] Somad & Tati Herawati's play. (1995). *Orthopedagogics for Deaf Children*. Bandung: Ministry of Education and Culture Director General of Higher Education.
- [56] Sukadi. (2012). *Improving Reading Ability Through a Multisensory Approach for Mild Mentally Impaired Children Class V SLB-C Ma-Arief Muntlan Academic Year 2011/2012*. Essay. Yogyakarta: Yogyakarta State University
- [57] Sumanto. (2014). *Developmental psychology*. Yogyakarta: CAPS.
- [58] Wuriyanto, B. (2019). Literacy of Indonesian Language and Literature Towards Professional Entrepreneurship in the Era of the Industrial Revolution 4.0 and Society 5.0 (Opportunities and Challenges). *Proceeding SENASBASA*. Issue 1, 11.