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Speech Intervention for Deaf-Autistic Students in Addressing Difficulties in Arabic Letter Pronunciation

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ENGLISH ABSTRACT
Speech intervention for deaf-autistic students is a crucial yet under-researched area within Qur'an learning framework. Previous scholarship predominantly features visual and sign-language media, frequently neglecting touch-based articulation therapies like anatomical massage. This study aims to delineate targeted speech intervention models for deaf- autistic students and analyze the clinical factors dictating their implementation. Utilizing a qualitative descriptive design, primary data were gathered through field investigations at Qotrunnada Islamic Special School (SLB) in Bantul, Yogyakarta. The research subjects comprised four deaf- autistic students differentiated by age, hearing-loss severity, and behavioral spectrums. Data validation was secured via collaborative data triangulation involving the clinical expert consultant. The findings establish three primary empirical components of the intervention: (1) structured facial and lip desensitization massage, (2) targeted tongue placement training using customized spatels, and (3) systematic phonetic articulation drillings. Based on these components,

the study presents three distinct pedagogical typologies categorized according to the students' neurological and auditory baseline capacities. These results demonstrate that speech proficiency outcomes are strictly conditional upon individual attention spans and speech-organ elasticity rather than visual stimuli alone. Ultimately, this systemic framework provides an evidence-based roadmap for special education practitioners developing tactile speech therapy instruments for multi-disabled learners.

Keywords: Speech Intervention, Deaf-Autistic Students, Arabic Letter Pronunciation

INDONESIAN ABSTRACT

Intervensi bicara untuk siswa tunarungu-autisme merupakan konteks penting dalam lingkup pembelajaran Al-Qur'an. Dalam konteks ini, beberapa penelitian sebelumnya berfokus pada pendekatan media dan visual, mengabaikan pembahasan intervensi bicara untuk mengatasi kesulitan pengucapan huruf Arab (hijaiyah) berdasarkan pijatan dan artikulasi. Oleh karena itu, penelitian ini bertujuan untuk menunjukkan bentuk-bentuk intervensi bicara yang dirancang untuk siswa tunarungu-autisme dan faktor-faktor yang memotivasi penggunaan teknik terapi tersebut. Analisis deskriptif kualitatif ini mengandalkan data primer yang dikumpulkan melalui investigasi di SD Khusus Islam (SLB) Qotrunnada di Bantul, Yogyakarta. Data tersebut terdiri dari berbagai metode yang diterapkan dalam terapi pengucapan huruf Arab dan penentu gangguan artikulasi. Selain itu, subjek penelitian dibatasi pada siswa tunarungu-autisme yang dikategorikan berdasarkan usia, jenis ketunarunguan, dan autisme. Berbagai hasil penilaian dan respons terhadap intervensi bicara ditunjukkan dan validasi data dilakukan melalui interaksi dengan kepala sekolah sebagai tim peneliti. Hasil penelitian menunjukkan bahwa intervensi bicara mencakup 1. pijat wajah dan bibir, 2. latihan penempatan lidah dengan alat bantu (spatel), dan 3. latihan artikulasi untuk mengatasi kesulitan dalam pengucapan huruf Arab. Kontribusi ini berfungsi sebagai panduan dasar dalam mengembangkan instrumen terapi pengucapan huruf Arab yang dirancang untuk siswa berkebutuhan khusus.

Kata kunci: *Intervensi Bicara, Siswa Tunarungu-Autisme, Pelafalan Huruf Arab*

Introduction

Deaf students are known to face difficulties in sound absorption (Al-Ibrahim, 2019), resulting in a perception of silent, unclear, and difficult-to-understand pronunciation (Kermit, 2019). In addition, these students communicate using sign language and are unable to hear or produce sounds accurately due to impairments in articulation and sound organs (Jackson et al., 2021). Due to the articulation difficulties, different challenges are experienced in communicating with language (Bergeron et al., 2020). Meanwhile, the characteristics of autistic students include experiencing impairments in communication, social interaction, sensory perception, emotions, and behavior (Kojovic et al., 2019). The complexity of the impairments results in difficulties in learning.

Previous research shows that autistic students mainly receive nonverbal responses, particularly those with moderate to severe characteristics. Meanwhile, verbal responses are observed only in mild autism cases (Schwartz et al., 2020). Deaf- autistic students experience hearing impairments, resulting in a lack of focus, poor concentration, excessive movements, tantrums, and other unproductive behaviors (Bluyssen et al., 2020). These inherent characteristics pose numerous challenges in learning, particularly in pronouncing letters, including Arabic (*hijaiyah*).

The research on the pronunciation of deaf students can be classified into 3 categories. The first includes the use of media to improve pronunciation skills, with the understanding that deaf students are primarily visual learners. Therefore, learning media such as authentic objects, replicas, and pictures as well as the use of picture cards, Arabic letter cards, and Iqra books are crucial to enhancing speaking, pronunciation, communication, and reading skills (Ridwan & Koestini, 2019; Riza et al., 2018; Suciningrum et al., 2020). In this context, pronunciation learning demands increased visuospatial processing from the early visual and parietal cortex. Deaf students acquire auditory language skills through visual motion perception (Kang et al., 2004) and the use of card-based media to comprehend meaning and read the Qur'an (Rosalinda et al., 2022). Meanwhile, the second category comprises Qur'an learning strategies, such as the visual motion approach of sign language and the vocal sound approach (Pamungkas & Hermanto, 2022; Rosalinda et al., 2022). Teaching through the sign system has shown considerable efficacy in helping individuals with disabilities to master *makharijul huruf* and reading the Qur'an correctly (Andriyanto et al., 2018; Wibawa & Suci, 2021). Concerning the third category, vocal and consonant exercises are used to focus on the pronunciation of Arabic letter sounds, without the need for attention-focused therapy (Mahfud et al., 2023; Thida et al., 2020; Wibawa & Suci, 2021). The fourth category includes learning with media technology devices that capture sentences (audio) spoken by the general public to be converted into text through speech recognition (Lim et al., 2022; Mahfud et al., 2023). Additionally, mobile media and learning focusing on language phonics have been used (Lim et al., 2022). Existing research in this field predominantly focused on media and visual approaches to sign language animation, as well as vocal and consonant processing exercises, ignoring the discussion of Arabic letter pronunciation therapy. Therefore, a comprehensive exploration of Arabic letter

pronunciation therapy based on articulation disorders is limited, specifically research on deaf-autism students.

Speech intervention is an action performed by therapists to aid individuals experiencing disorders (Nur Avindi Yusup & Muryanti, 2022). Therapy action to assist students with hearing impairments is referred to as intervention (Nur Avindi Yusup & Muryanti, 2022). The forms of speech intervention for disabled students include the utilization of Dynamic Hijaiyah Braille Display Media. This media offers the advantage of Arabic letters in braille characters, capable of producing sound corresponding to the pressed letters. Learning progress can be monitored virtually by parents or teachers through an Android application. This research is designed with an electronic system capable of accommodating 2 cells of Arabic braille characters and symbols. Furthermore, the device is equipped with voice features and an integrated Android application (Anggara et al., 2021). The development of an application using the Gillingham method and augmented reality aids intellectually disabled children in recognizing Arabic alphabet letters. The Gillingham method uses a visual, auditory, kinesthetic, and tactile (VAKT) approach to enhance memory and understanding. A multisensory mechanism is used to provide learning stimuli through sound, images, and tactile sensations to adapt the letters (Jackson et al., 2021). The method focuses on the relationship between sounds and letters using a multisensory approach (Afrianto et al., 2019). In addition, Arabic letter learning for deaf students is facilitated through card media. The teaching materials used are similar to other elementary school students. However, the methods adopted are alphabet and mind map reading to improve memory in learning *Juz 'Amma* (Rachmayanti & Alatas, 2020).

Deaf is a disorder caused by lesions in the superior temporal gyrus of the dominant hemisphere, isolating the Wernicke's area from incoming auditory information. This area is supplied by branches of the middle and posterior cortical temporal arteries of the middle cerebral artery (Kanter et al., 1986). The deaf students' skills in speaking, reading, writing, and processing non-verbal auditory stimuli remain intact but differ from those with normal hearing (Hall et al., 2019). During the tactile phase of language and speech development, no obstacles are encountered (Deocampo et al., 2018). The moment the speech skills are developed, imitation is limited to physical gestures and movements. It is widely believed that reading is not suitable for the early stages of language development (Villwock et al., 2021). Additionally, the use of sign

language has been criticized for isolating deaf students from the general community (Snoddon, 2020). In this context, verbal language is considered the highest and most distinctive form of human communication, hence must be developed and used. Deaf students have to learn vocabulary and articulate words with proper and clear pronunciation to acquire language effectively. An essential lesson that requires real-life experience is practicing oral articulation and going through the stages of therapy, such as learning Arabic letter sounds.

Individuals are considered deaf when a disorder or damage is presented in one or more of the outer, middle, and inner ear organs, which hinders proper hearing due to disease, accident, or other unknown causes (Ahmad et al., 2022; Patrick et al., 2020). Deaf individuals can be categorized into two, namely deaf and hard of hearing. This can be further classified into conductive (Bruchhage et al., 2017), sensorineural (Ifukube, 2017), conducive (Maier et al., 2022; Milano et al., 2016), perceptual (Kujawa & Liberman, 2019), and mixed deaf (Lintangsari et al., 2021; Lintangsari & Emaliana, 2020).

Autism comes from the word auto which means alone. This condition is a symptom of complete self-reclusion, extreme preoccupation with thoughts and fantasies (Sriyanti, 2020), as well as impaired social development (ali et al., 2019). Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by social communication difficulties, abnormal behavior patterns, or restricted and repetitive activities, causing difficulties in social interaction, communication, and participation in daily activities (Baron-Cohen et al., 2009; Lai et al., 2013; Matthew J. Maenner et al, 2023; Van Wijngaarden-Cremers et al., 2014). ASD has evolved from a form of mental illness to a cognitive condition (Chapman, 2019). Furthermore, the condition is assessed as having a difficult, quiet, and awkward personality/behavior (Chapman, 2019; Lai et al., 2013) with a higher prevalence in males (Bergeron et al., 2020; Lirio, 2020).

Language deficits in autism individuals include perceptual, productive, and physiological dysfunctions (Hall et al., 2019; Mahfud et al., 2021; Moisik et al., 2021). The main cause is auditory processing dysfunction, which can lead to deficits in speech recognition (Lirio, 2020). The brainstem has been shown to play a central role in the synchronization of neural responses, and the deficits are associated with changes in absolute latency, interpeak latency, and amplitude of auditory brainstem response (ABR) waves to speech stimuli (Ramezani et al., 2019). Meanwhile, the cause and cure

for autism have not been discovered (DeFilippis & Wagner, 2016). Previous research showed that autism results from a genetic etiology and the non-genetic factors include pregnancy complications, drug exposure during pregnancy, environmental factors, and premature birth (Chen et al., 2019).

The characteristics of autistic students include 1) Tendency to show symptoms of anxiety (den Houting et al., 2018; Magiati et al., 2016; Sukhodolsky et al., 2008), 2) Language impairments (both verbal and nonverbal), limitations in communication processes, 3) Tendency to neglect social contact with the wider community (Bosra et al., 2020), 4) Communication disorders. Autism individuals typically experience speech delays, communication occurs in a disorganized manner, expressing meaningless words that others cannot understand, 5) Social interaction disorders. Children tend to reject or avoid eye contact, do not respond when called, and make no effort to interact with others, 6) Behavioral disorders include excessive or exaggerated behaviors shown by motor hyperactivity, 7) Deficiency in behavior shown by sitting in silence with empty eyes and playing monotonously, 8). Emotional disturbance, and 9). Sensory disorders to stimuli. Some individuals cannot differentiate between sweet, bitter, and salty tastes. Karen A. Kuhlthau et. Al. found that there was a relationship between physical and mental health with the behavior of autism children (Kuhlthau et al., 2018).

Factors contributing to the success of teaching autistic students include 1) Teacher's innovative teaching methods, patience, and emotional closeness to students. 2) Autism children can be taught sign language as an alternative method of communication, where some children have begun to speak sign language. Body language communication holds more meaning, 3) Visual support: Autism children have difficulty understanding verbal communication in sequential actions. Therefore, organizing teaching through visual images depicting sequential actions is highly effective, 4) Modeling: This method is highly effective when the process is recorded on video and can be watched after the task is completed. The approach also applies to siblings since parental intervention is a key element in preparing autism children for the learning and communication process (Kharatyan & Hovyan, 2021).

This research aimed to show various forms of speech intervention to address difficulties in Arabic letter pronunciation for deaf- autistic students and the motivating factors behind the use of the techniques. The argument is that deaf students tend to rely on visual stimuli to acquire information, knowledge, and experiences through sight.

Meanwhile, those affected by autism often require concentration therapy, speech organ massage, tongue placement exercises with tools, and articulation exercises to aid in Arabic letter pronunciation. This shows that proficiency in pronunciation varies based on the level of deafness and autism.

Methods

This research focuses on speech intervention for Arabic letter pronunciation of deaf- autistic students. The three main reasons justifying the selection of the topic are 1) limited attention in previous research, 2) issues faced by deaf-autism students, and 3) speech intervention such as facial and lip massage, tongue placement exercises with tools, and articulation exercises to enhance pronunciation. The research was conducted at Qotrunnada Islamic Special School (SLB) in Bantul, Yogyakarta. There are 31 deaf students at the school. The students consist of 20 students with pure deafness, 4 deaf students with autism, 3 deaf students with ADHD, 2 deaf students with intellectual disability, 1 deaf student with slow learning disabilities, and 1 deaf tudent with cerebral palsy.

This study is a follow-up to a previous study on pronunciation therapy for the hijaiyah letters for students with complete deafness. The article, "Pronunciation therapy for deaf students coping with Arabic letter difficulties," was published in the scopus journal IJERE in 2024 (Astari et al., 2024). There were four deaf-autistic students with varying ages, geographic backgrounds, and levels of deafness and autism (mild autism, moderate autism, and severe autism). This sample determination is in accordance with Creswell's opinion (Creswell and Poth 2016) and the samples include 4 students from Yogyakarta and Central Java. Each student was assessed in the PLB (laboratory for Children with Disabilities) at Yogyakarta State University (UNY) upon enrollment at Qotrunnada Islamic Special School. Afterward, researchers and teachers identified the students' pronunciation skills in the hijaiyah alphabet, interpreted the causes of pronunciation difficulties, and assessed treatment techniques and therapies.

Each of the students shows different assessment results and responses to pronunciation therapy, validated by the school principal acting as a consultant with the research team.

The qualitative method relies on both primary and secondary data. The primary data are collected through observations at Qotrunnada Islamic SLB in Bantul, Yogyakarta. The collected data include forms of speech intervention to address

difficulties in Arabic letter pronunciation for deaf- autistic students and the motivating factors behind the use of facial and lip massage therapy, tongue placement exercises, and articulation therapy. The three therapies are based on the initial assessment of students who tend to experience attention deficits and pronunciation difficulties. Moreover, secondary data are obtained through a comprehensive literature review including books and journal articles related to Arabic letter learning as well as the use of achievement indicator books to assess pronunciation.

The data collection method used was observation, interviews, and group discussions. This research also adopts content validity where the instrument determines the extent to which the items represent the content of the object and reflect the behavioral characteristics to be measured. In addition, reliability is used to determine the consistency of the instrument in different research with almost or close to the same results. An assessment from experts is needed to ensure that the content of the instrument is appropriate for measuring the data (R. J. Gregory, 2007).

This research includes 2 parties for data collection, namely (a) informants, consisting of pure deaf students, as well as (b) class teachers and Arabic letter pronunciation instructors. The process starts with a desk review, field observations, interviews, and focus group discussions. Before the investigation, a review is conducted on changes in Arabic letter pronunciation. Observations are made with varying disorders and pronunciation therapy, allowing for direct comparison. Furthermore, interviews are conducted with 3 teachers, namely TP, RA, and GL in Arabic letter pronunciation sessions. TP who is the school principal serves as a validator of the Arabic letter sound acquisition data of students. Moreover, focus group discussions (FGDs) are held to confirm initial findings regarding pronunciation skills and therapy of students.

Data collection starts with observing and recording deaf- autistic students during Arabic letter pronunciation while reading results are listened to and repeated. The sample consisted of 31 deaf students. Five students with multiple deafness and autism were included. Data collection was conducted in collaboration with the school. The school conducted an initial assessment during student registration at Qatrunnada Special Needs School. The school obtained consent from the students' parents or guardians. Participants' identities were protected by using initials in their names.

In case of any mistakes or difficulties, therapy is provided and data analysis is conducted in 2 forms. The first form is a reduction from observations and interviews,

followed by data presented as summaries and synopses based on classification results, as well as data verification for the conclusion process. The second is an understanding technique, which starts with the restatement of the data found from observations and interviews. This is followed by a description to identify patterns or trends and concludes with an interpretation to show the meaning of the collected data.

Result and Discussion

Table 1 below shows the pronunciation skills data of deaf-autistic students in 2023 and 2024.

Table 1. Development of Students' Pronunciation

No	The beginning of entering Qotrunnada Islamic SLB	Name, age, deaf, and autism category	Initial pronunciation skills	Arabic letters that can be pronounced in 2023	Arabic letters that can be pronounced in 2024
1.	July 12, 2021	-AG (Date of birth: 7-3-2014) (9 years) -severe deaf -severe autism	none	a أَ 1 front vowel	أَ, إِ, أُ [a]. [i], [u]. 1 front vowel 2 back vowel
2.	January 4, 2022	-SU (Date of birth: 28-7-2012) (10 years) -severe deaf -mild autism	none	4 sounds: أَ ، مَ، ، وَ، ل،	11 sounds: أَ, إِ, أُ [a], [i], [u]. مَ, مِ, مُ [ma], [mi], [mu]. بَ, بِ, بُ [ba], [bi], [bu]. وَ, وِ, وُ [wa], [wi], [wu]. لَ, لِ, لُ [la], [li], [lu]. تَ, تِ, تُ [ta], [ti], [tu]. دَ, دِ, دُ [da], [di], [du]. نَ, نِ, نُ [na], [ni], [nu]. يَ, يِ, يُ [ya], [yi], [yu]. ضَ, ضِ, ضُ [dha], [dhi], [dhu].

3.	July 13, 2022	CA (Date of birth: 10-24-2018) (5 years) - severe deaf - mild autism	none	3 sounds: أَ ، مَ، بَ،	طَ, طِ, طُ [tha], [thi], [thu]. 4 sounds: أَ, إِ, أُ [a], [i], [u]. مَ, مِ, مُ [ma], [mi], [mu]. بَ, بِ, بُ [ba], [bi], [bu]. وَ, وِ, وُ [wa] [wi] [wu].
4.	July 13, 2022	FA (Date of birth: 28-4-2009) (14 years old) - severe deaf - mild autism	a, wa.	23 sounds: أَ، مَ، بَ، وَ، ل، تَ، دَ، طَ، ضَ، يَ، فَ، سَ، صَ زَ،جَ، ذَ، ، ثَ، شَ، حَ، غَ، خَ، عَ، هَ،	The 28 Arabic letters and the vowel marks (fathah, kasrah, and dhamah) can already be pronounced.

According to data number one (Ag), the student did not possess oral skills and could not pronounce Arabic letters and vocabulary during the initial assessment in July 2021. Meanwhile, sign language proficiency and vocalization were inefficient due to stiffness in the speech organs. The difficulty in starting pronunciation therapy was from the struggles with focus as well as the inability to follow instructions and imitate lip movements since the mouth muscles remained stiff. Emotionally, the student seemed indifferent to the surrounding environment, showing no expressions except crying and frequent tantrums, such as crying, screaming, and outbursts. The initial therapy included conditioning therapy, focus exercises, and facial orientation training. Pronunciation therapy comprised facial and mouth massages, as well as monotonous vocal exercises. In 2023, after being subjected to therapy for 20 months, the student could pronounce one Arabic letter but struggled with pronouncing the remaining 27 sounds.

In January 2024, the student continued to engage in conditioning exercises and focus training through collage activities, shaping, and cutting. Sign language could not be initiated due to a minimal concentration span, ranging from 1 to 3 seconds. The student had slow speech development and still could not be taught speech. Recently, the student started to pronounce front [a] [i] and back vowel [u] sounds and was still practicing [ma], [mi], but the pronunciation remained challenging. The speech organ massage, tongue and lip placement exercises with the help of tools, as well as articulation and sign language exercises, are shown in the following figure:

Figure 1. Facial and lip massage

Figure 2. Tongue placement exercises

Figure 3. Articulation and sign language exercises

Data number two (Su) showed that the student did not have oral and sign skills, or voice direction, and could not pronounce Arabic letters and vocabulary during the initial assessment in January 2022 since the speech organ was closed and stiff. The difficulty in starting pronunciation therapy was that the focus range was very low, with weak muscles in the hands and the speech organ (tongue). The level of emotions was still explosive and daily activities were directed and assisted by the teacher. Furthermore, the initial therapy was attention concentration and sound direction exercises. Speech intervention was face and hand massages, monotonous vocal exercises, diphthongs, and tactile exercises.

In 2023, after 14 months of therapy, the student was able to pronounce the 3 Arabic letters but had difficulty pronouncing the remaining 25 sounds. In January 2024, sign learning volume 2 was considered because the oral skills were very slow as well as the brain, hand, eye, and voice coordination. However, the student continued with voice therapy and new pronunciation was on front vowel sounds [a i], back vowel [u], plosive consonants [ba bi bu], [ta ti tu], [da di du], [dho dhi dhu] [tho thi thu], [la li lu], nasal consonants [ma mi mu], [na ni nu], consonants [ya yi yu], [wa wi wu]. The fricative sounds [fa fi fu] and [sa si su] still needed practice in pronunciation due to the difficulty of breathing out. This was followed by speech organ massage, tongue and lip placement exercises with the help of tools, and articulation exercises.

According to Data Number three (Ca), the student did not have oral skills at the initial assessment (2022), and could not pronounce Arabic letters due to the stiffness of the speech organ. The emotional condition was indifferent to the surrounding environment and there was no expression. The cause of pronunciation difficulties was attention deficit disorder, only being able to cry and scream. The student did not have voice and facial direction, or gesture skills, and was often stuck. The initial therapy was facial and voice direction exercises, while pronunciation therapy consisted of exercises to imitate mouth shapes, pre-oral/vocal monotongs and diphthongs, breathing exercises, as well as tactile exercises.

In 2023, the student was able to pronounce the 3 Arabic letters, namely (أَ ، مَ، بَ) after 8 months of therapy. Furthermore, in January 2024, vowel sounds [a i u], nasal consonants [ma mi mu], plosive consonants [ba bi bu], and consonants [wa wi wu] were pronounced. However, tongue therapy was still used to be able to reach the articulation points on the gums because letter sounds were articulated by sticking out the organ. The pronunciation of alveolar plosive consonants [ta ti tu], [da di du] was very difficult, while [wa wi wu] was pronounced with the formation [ua ui uu]. The development was sufficient because the student did not have tantrums, the emotions were under control but there was weakness in the speech organ. The intervention included speech organ massage, placement of the tongue and lips with the help of tools, and articulation exercises.

Data Number 4 (Fa) showed that the oral skills were able to communicate in 2 directions with chaotic articulation and limited conversation during the initial assessment in July 2022. Articulation was not clear, many letters sounded the same and were omitted since the tongue was unstable and thin. The student had sufficient vocabulary and a little sound directionality and only [a] and [wa] Arabic letters were pronounced since the tongue was a bit stiff, thin, and pointed. The speech intervention was oral massage, swallowing, tongue placement with the help of a spatel, and pronunciation exercises for the letter sound [r]. In 2023, after 8 months of therapy, the student was able to pronounce 24 Arabic letters but had difficulty pronouncing 5 letters, namely (رَ ، قَ، كَ، ظَ نَ). In January 2024, all the letters as well as *harakat* of *fathah*, *kasrah*, and *dhammah*, could not be pronounced but could read Arabic vocabulary with *tajwid*, such as long and short as well as *tanwin* letters.

This research obtains 3 typologies of speech intervention for deaf- autistic students. **First**, for those with severe deafness and autism, the focus lies on concentration therapy before speech intervention, as well as facial and mouth massage. For articulation, the focus is on monotonous vocal exercises. The articulation skills are only able to reach the front vowels [a] and [i], as well as [u]. After speech intervention, students can move the tongue front or back as well as raise or lower the organ. **Second,** speech intervention for the severe deaf and mild autism without oral skills, voice, or facial direction. Students still need concentration therapy due to the focus range being very low, with facial and hand massage. Articulation training consists of monotonous vocal exercises, diphthongs, and tactile movement. Students' skills constitute the

pronunciation of vowel and consonant sounds, starting from the front bilabial plosives, nasals, and fricatives. Individuals who experience speech organ weakness are only able to reach bilabial and alveolar plosive consonants. **Third,** speech intervention for students with severe deaf and mild autism with oral skills and voice direction (4th data example). The articulation of vowel sounds and plosive, nasal, fricative, and trill consonants can be directly trained to pronounce the 28 Arabic letters complete with *harakat*. The 3 typologies of speech intervention are shown in Figure 4.

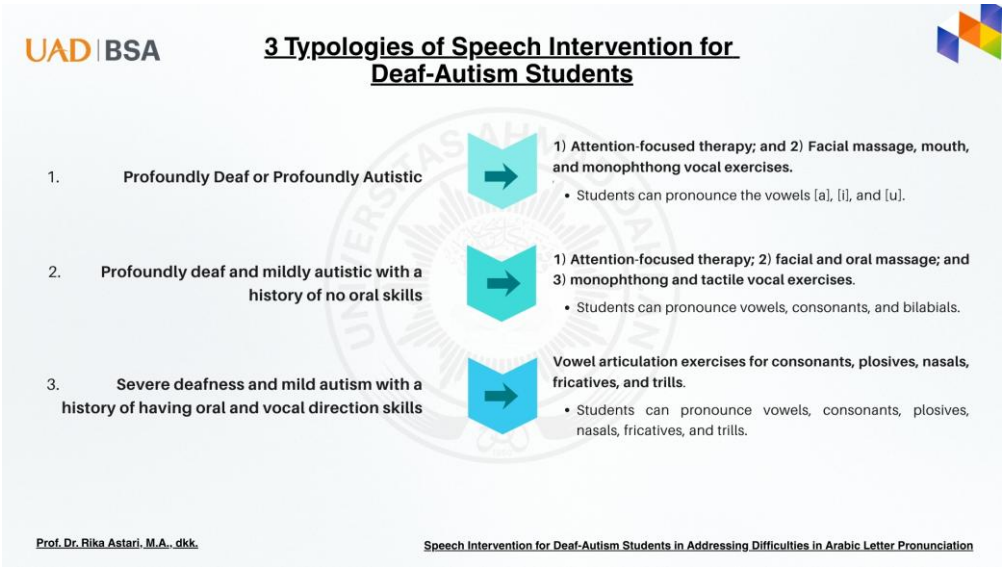

Figure 4. 3 Typologies of speech intervention for deaf- autistic students

The levels of deafness and autism have led to differences in the ability to receive speech intervention. This occurs due to the level of concentration, withering of the speech organs, and the muscles of the mouth remaining stiff. The speech intervention for hearing impairment and autism has a higher level of difficulty, where 3 disorders are encountered. First, autistic students experience problems with perception and memory. Second, disturbances caused by lesions of the superior temporal gyrus in the dominant hemisphere isolate Wernicke's area from incoming auditory information (Kanter et al., 1986). Third, the disorder occurs in the temporal lobe. There is damage to language function, associated with reduced and increased Broca's and Wernicke's area activity, respectively. Furthermore, this area plays a role in moving the speech muscles needed for the pronunciation of words. The amount of vocabulary is directly proportional to the ability to think with language. Disorders of Wernicke's is located in the superior temporal gyrus of the left hemisphere and functions as the center for understanding words. Damage to this part will disrupt all language functions, including speaking,

understanding, reading, writing, imitating words, and naming objects. The combination of disorders in the deaf and autism means the level of difficulty is higher.

This research is also different from results that discussed learning Arabic letters by using the Gilingham application and augmentative reality, namely the use of visual, auditory, kinesthetic, and tactile (Afrianto, Faris, and Atin 2019). Previous research showed that speech for autistic students was blocked, and could not be taught directly. Therefore, therapy is needed by spelling syllables (Aravamudhan and Awasthi 2021), sign language (Kharatyan and Hovyan 2021), repetitive oral therapy, reading lips or facial expressions (Datz, Wong, and Löffler-Stastka 2019) as well as the use of visual learning media, such as objects, pictures, and animations. Lip reading therapy cannot solve the problem of pronouncing similar sounds, such as the sounds حَ [ħa] and هَ [ha]. Concerning the strength of this research, speech intervention can be carried out orally as well as through massage of the speech apparatus, tongue placement exercises, and articulation accompanied by sign language.

Conclusion

In conclusion, speech intervention before pronunciation therapy for deaf, autism older students were focused on brain perception and memory disorders. Impaired concentration, memory, and speech apparatus caused a delay in receiving pronunciation therapy compared to the pure deaf. Speech intervention for deaf- autistic students included facial and lip massage, tongue placement with the help of a spatula, and articulation exercises. The processes were influenced by differences in students' concentration levels, the droopiness of the speech organs, and stiff mouth muscles. Furthermore, the research provided a new perspective on speech intervention for deaf-autistic students. In previous results, this topic was only approached from the perspective of learning media, but the current research offered a different approach to speech intervention, combining attention concentration, massage, tongue positioning, and articulation exercises. The analysis was related to the level of deafness and autism, providing a perspective to address difficulties in articulating Arabic letters solely from the perspective of visual learning media. Speech intervention shows promising progress in the observed cases of deaf-autistic students, but stronger claims require more and clearer evaluation data.

The strength of this research was manifested in the model/alternative speech intervention, which served as a approach to assist in learning Arabic letter sounds and vocabulary pronunciation for students with special needs. However, the scope was limited to a school and deaf- autistic students at the SLB 1 level. This showed that the results could not be generalized to address various types of therapies on a larger scale, such as students with intellectual disabilities, ADHD, cerebral palsy, slow learners, and behavioral disorders. Additionally, this research was limited to analyzing one region and at the level of deaf-autism, comparison of research cases of deaf students with autism and the limited number of students who are not found in large numbers.

The analysis did not allow the results to be used as a reference to explain the differences in speech intervention among deaf students with other disorders on a broader scale. Due to the limitations, further research was required, considering comparative aspects regionally and drawing from more varied data sources. In this context, more appropriate policies could be formulated for addressing Arabic illiteracy among disabled students.

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