Original Research Report

DIFFERENCES IN THE DEVELOPMENT OF LANGUAGE AND SOCIAL INDEPENDENCE IN CHILDREN WITH SPEECH DELAY AND SENSORINEURAL HEARING LOSS BASED ON THE AGE FOR EARLY INTERVENTION AND THE DURATION OF AUDITORY-VERBAL THERAPY

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ABSTRACT

Speech delay is primarily attributed to sensorineural hearing loss, which may significantly impact a child's language development and social independence. Consistent and periodic auditory-verbal therapy as an early intervention has the potential to positively influence language development, thereby fostering independence in children. The objective of the research was to examine the differences in the development of language and social independence among children who have speech delay and sensorineural hearing loss at the children's age for early intervention and with the duration of auditory-verbal therapy taken into consideration. The research employed an analytical-observational design with a cross-sectional approach and total sampling. The sample comprised 29 children who were undergoing the weekly routine of auditory-verbal therapy at Yayasan Aurica, Surabaya, Indonesia. The tool utilized in this study was the Pre-Screening Developmental Questionnaire. The data underwent bivariate analysis, specifically using the Chi-squared test with a significance level set at a p-value of <0.05. The language development analysis resulted in a p-value of 0.013 for the age variable and a p-value of 0.019 for the therapy duration variable. Meanwhile, the social independence analysis yielded a p-value of 0.229 for the age variable and a p-value of 0.111 for the therapy duration variable. In conclusion, the influence of age on early intervention had a significant difference from that of the duration of auditory-verbal therapy on the language development of children with speech delay and sensorineural hearing loss. Conversely, age and therapy duration did not exert any meaningful difference in terms of their influence on the children's social independence development.

Keywords: Sensorineural hearing loss; auditory-verbal therapy (AVT); inclusive health; early intervention

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Highlights:
1. This study explored the significance of auditory-verbal therapy as an early intervention for children with speech delay and sensorineural hearing loss, a topic that deserves further research in developing countries such as Indonesia.
2. The findings highlight the significance of age and therapy duration on the language development of children with speech delay and sensorineural hearing loss.

INTRODUCTION

Speech delay refers to a condition where a child's ability to speak develops slower in comparison to other children of the same age. The cause of this delay is frequently attributed to the presence of sensorineural hearing loss. Children who have both speech delay and sensorineural hearing loss

experience language development that significantly falls behind the developmental milestones expected for their age. Furthermore, children with this condition exhibit speech and language development that differs qualitatively from that of typical children (Hartanto 2018). The World Health Organization estimated that there are 466 million individuals worldwide experiencing hearing loss, with 34 million of them being children. Approximately 60% of these cases are preventable (Olusanya et al. 2019). Indonesia ranks fourth among Asian countries due to the high prevalence of hearing loss at 4.6%. Additionally, the prevalence of deafness across all age groups in seven provinces of Indonesia is 0.4%. Globally, it is estimated that 1–3 babies per 1,000 live births are affected by congenital deafness. This rate increases to 2–4 out of every 100 babies in intensive care units (Minister of Health of the Republic of Indonesia 2022).

Maulana (2021) conducted an investigation on children who were diagnosed with congenital hearing loss at an early stage of their lives. The study revealed that early intervention resulted in an improved quality of life in later years. On the other hand, children who did not receive early intervention exhibited a contrary effect. Children with hearing loss who are not identified early may miss a critical window for language development. This can lead to potential delays and deficiencies in speech and language skills, ultimately limiting their academic achievement and career prospects. The failure to promptly detect and intervene in cases of hearing loss can result in a significant social burden on the affected children, highlighting the need for tailored therapy and education (Purnami et al. 2018). Hearing loss can also impede children's development of social independence, as language plays a crucial role in achieving independence. Children who are unable to effectively communicate their needs and wants, or who struggle to express themselves and are not understood by others, may encounter barriers to developing confidence and independence (Hurlock & Sijabat 2017).

Early intervention is essential for addressing speech delays and hearing loss in children. A common occurrence in society is that parents often become aware of a disorder only when their child exhibits a speech delay. This is largely because they lack awareness regarding the critical importance of early detection and intervention for hearing problems in children (Maulana 2021). The American Academy of Pediatrics Committee and the Joint Committee on Infant Hearing recommend that congenital hearing loss be diagnosed before the age of 3 months and treated before the age of 6 months. This pertains to the critical phase of language development, which starts in the first 6 months of life and continues until the age of 2 years (American Academy of Audiology 2019).

It has been recognized that the critical developmental periods are significant for gaining language skills. Therefore, it is imperative to offer early intervention for children with hearing loss in the domain of language acquisition (Rahardja et al. 2010). Auditory-verbal therapy (AVT) maximizes residual hearing by utilizing hearing aids or cochlear implants to identify sounds. The adoption of contemporary hearing technology has enabled children with hearing impairments or those who are hard of hearing to attain the highest possible acoustic neurological advantages. The primary goal of the auditory-based verbal approach is to empower children to harness their auditory potential for effective communication through spoken language (Putri & Purbaningrum 2020). Parents, therapists, and children engage in playful activities with the goal of facilitating auditory-verbal learning. These activities are intended to enhance the child's residual hearing, allowing them to achieve auditory skills comparable to those of children with typical hearing (Ratih & Rini 2015). Hence, this study aimed to examine the differences in the development of language and social independence among children with speech delay and sensorineural hearing loss. This was achieved by assessing their enrollment age for the early intervention program and the duration of therapy they received.

MATERIALS AND METHODS

This study used an observational analytical design with a cross-sectional approach to investigate the differences in the development of language and social independence among children with speech delay and sensorineural hearing loss. The variables examined included the age at which the children were enrolled in the early intervention program and the duration of auditory-verbal therapy they attended. The cross-sectional design was employed to analyze the relationships between variables and their outcomes by collecting data at a single point in time (Abduh et al. 2022). The inclusion criteria for this research comprised children who underwent regular weekly auditory-verbal therapy and parents who consented to have their children participate as respondents. A total sampling method was employed to select the sample, which consisted of 29 children. The research was conducted at Yayasan Aurica, Surabaya, Indonesia, from February to September 2022, following the approval of the research proposal.

The data collection instrument employed in this research was the Pre-Screening Developmental Questionnaire, which was designed to assess

children's development of language and social independence. The questionnaire was distributed to the parents of the respondents following the completion of the auditory-verbal therapy. The children's development in language and social independence was categorized as normal if all responses on the questionnaire were "yes." Conversely, it was deemed to be at risk for a disorder if there was at least one "no" response on the questionnaire. Additionally, the assessment results were categorized using secondary data pertaining to the age of the children when they started the early intervention program and the duration of therapy they received. The data processing techniques used were editing, coding, data entry, data cleaning, and tabulation methods (Misbahuddin 2022). In this research, a bivariate analysis was performed using the Chi-squared test, with a significance level established at $p<0.05$. The data were further analyzed using IBM SPSS Statistics for Windows, version 25.0 (IBM Corp., Armonk, N.Y., USA) to ascertain differences between the two dependent variables and the two independent variables.

RESULTS

The results of the analysis using the Chi-squared test were organized and presented in the form of frequency distributions. Table 1 summarizes the distribution of respondents according to the degree of their hearing and the assistive devices they used.

Table 1. Distribution of hearing loss and assistive devices among the respondents.

Characteristics	n	%
Hearing thresholds		
0–15 dB	0	0
16–25 dB	0	0
26–40 dB	0	0
41–55 dB	0	0
56–70 dB	2	6.9
71–90 dB	4	13.8
>90 dB	23	79.3
Total	29	100
Devices		
Hearing aid	10	34.5
Cochlear implant	19	65.5
Total	29	100

The results of this study revealed that the majority of the respondents (79.3%) experienced profound hearing loss, as indicated by a threshold above 90 dB. Severe and moderately severe hearing loss were the second and third most prevalent degrees of hearing loss, respectively. Cochlear implants were the most commonly used assistive devices (65.5%) to support the children's remaining hearing. Meanwhile, 34.5% of the respondents used regular hearing aids.

Table 2. Distribution of the respondents' development of language and social independence.

Variables	n	%
Language development		
At risk of disorder	7	24.1
Normal	22	75.9
Total	29	100
Social independence development		
At risk of disorder	11	37.9
Normal	18	62.1
Total	29	100

Table 3. Distribution of the respondents' age for early intervention and the duration of therapy.

Variables	n	%
Age		
≤3 years	16	55.2
>3 years	13	44.8
Total	29	100
AVT duration		
≤2 years	22	75.9
>2 years	7	24.1
Total	29	100

Note: AVT=auditory-verbal therapy.

As displayed in Table 2, 24.1% of the children were identified as being at risk of experiencing impaired language development. Additionally, Table 3 shows that 37.9% of the children were at risk of impaired development of social independence. More than half of the children (55.2%) received early intervention when they were still in the age category of ≤3 years. A majority of the children (75.9%) attended auditory-verbal therapy for a duration of two years or less. These results were additionally analyzed to identify any differences in the development of language and social independence among the respondents.

Table 4. Differences in language development according to age for early intervention and therapy duration.

Variables	Language development				Total		
	At risk of disorder		Normal				
	n	%	n	%	n	%	
Age							
≤3 years	1	6.3	15	93.7	16	100	p=0.013
>3 years	6	46.2	7	53.8	13	100	
Total	7	24.1	22	75.9	29	100	
AVT duration							
≤2 years	3	13.6	19	86.4	22	100	p=0.019
>2 years	4	57.1	3	42.9	7	100	
Total	7	24.1	22	75.9	29	100	

Table 4 presents data on the children's language development according to their age of enrollment in the early intervention program and the duration of therapy they completed. A single respondent (6.3%) who received early intervention at the age of ≤3 years was found to be at risk of disorder. As many

as 46.2% of the respondents who initiated their therapy after the age of 3 years also exhibited a risk of disorder. When examining the duration of auditory-verbal therapy, 13.6% of the children who had therapy for two years or less were found to be at risk of developing a disorder. Among those who underwent therapy for over two years, the proportion of respondents at risk of disorder was 57.1%. Nevertheless, the Chi-squared test revealed significant differences in the respondents' language development according to their starting age (p=0.013) and therapy duration (p=0.019).

Table 5. Differences in the development of social independence according to age for early intervention and therapy duration.

Variables	Social independence development				Total		
	At risk of disorder		Normal				
	n	%	n	%	n	%	
Age							
≤3 years	4	31.8	12	68.2	16	100	p=0.111
>3 years	7	57.1	6	42.9	13	100	
Total	11	37.9	18	62.1	29	100	
AVT duration							
≤2 years	7	31.8	15	68.2	22	100	p=0.229
>2 years	4	57.1	3	42.9	7	100	
Total	11	37.9	18	62.1	29	100	

The data shown in Table 5 demonstrate the respondents' development of social independence in relation to their starting age and therapy duration. As many as 31.8% of the respondents who began receiving early intervention at or before the age of 3 were found to be at risk of developing a disorder. In the meantime, among those who started their therapy after the age of 3, the prevalence of the risk of disorder reached 57.1%. When considering the auditory-verbal therapy, it was found that 31.8% of the children who had received it for a duration of two years or less were at risk of disorder. As many as 57.1% of the respondents who had received therapy for over two years also faced a risk of disorder. Overall, the data indicated no significant differences in the development of social independence according to the age for early intervention (p=0.111) and the duration of therapy (p=0.229).

DISCUSSION

In order to foster language skills, particularly in listening, humans require the sense of hearing as a means to receive information. The development of a child's auditory system in the early stages of life heavily relies on stimulation from the environment, which provides crucial auditory input (Putri & Purbaningrum 2020). According to Wagino & Rafikayati (2013), to minimize the impact of hearing loss, the primary focus should be on the development of language skills. Language development should take precedence over other aspects of development due to its essential nature and role as the primary prerequisite for child development. Proficient language skills in children can contribute to enhanced intellectual development and facilitate their ability to socialize with the environment, thereby fostering the development of social and emotional competencies. Additionally, this can also affect children's independence, as language plays a crucial role in fostering their social development (Hurlock & Sijabat 2017).

Effective management of speech delay necessitates strong collaboration between speech therapists and the rehabilitation team at the children's homes. Hence, parental involvement significantly impacts the success of addressing speech delays in children (Fitriyani et al. 2019, Sholehen et al. 2020). One of the intervention therapies that can be useful is auditory-verbal therapy. Heriyanti (2020) suggested that auditory-verbal therapy is a combined application of techniques, strategies, conditions, and procedures that promote the optimal acquisition of spoken language through listening. This method plays a major role in nurturing deaf children's personal, social, and academic lives. Auditory-verbal therapy is an approach that utilizes auditory stimulation to take advantage of residual hearing (Ratih & Rini 2015). Auditory-verbal therapy also seeks to empower children with hearing loss to effectively engage in verbal communication (both speaking and listening) and to facilitate their growth and learning within broader school and community settings. The purpose of this method is to enable the children to achieve their desired goals and participate more actively in their surroundings.

The analysis of the relationship between the children's language development and their starting age for early intervention showed a significant difference. Among those who were at risk of language impairment, the prevalence of respondents who initiated therapy at an earlier age was higher compared to those who started at a slightly older age. This aligns with the findings of a study by Jauhari (2020), who found that proper early detection and rehabilitation improve children's speech and language development. Delays in conducting timely detection will lead to delays in commencing interventions, which can have a detrimental impact on the children's future growth. According to Hartanto (2018), the first 36 months of life represent a critical period for language development. The rate of language development during this period cannot be replicated at any other stage of life. Children with hearing loss who start therapy late are at a higher risk of permanent speech and language disorders

compared to their peers who receive early intervention.

As Putri & Purbaningrum (2020) suggested, children with hearing loss who have early access to sound amplification and consistent communication exhibit superior spoken language than those who lack such access. Children's language skills continue to develop during a critical period within the first six years of their lives. Beyond this critical phase, their language skills will gradually decline, and the brain will no longer be capable of making significant changes in neural connectivity (American Academy of Audiology 2019). Heriyanti (2020) also corroborated this notion by discussing the ideal age for initiating the use of hearing technology. Early exposure to auditory stimulation through the use of hearing technology enhances language skills comparable to those of hearing individuals. The outcomes achieved will vary between children who use hearing technology from an early age and those who start at a later age.

Early detection and auditory stimulation are of the utmost importance for hearing loss in children. Timely identification of hearing loss in newborns through screening is necessary for immediate treatment (Wagino & Rafikayati 2013, Warasanti et al. 2020). In addition, the early intervention must take into account the critical period for neurological and language development, the assessment of the degree of hearing loss, as well as the utilization of amplification, medical technology, and auditory stimulation. It is crucial to diagnose auditory problems, as well as provide intervention and education, before a child reaches 6 months of age. This is because the auditory brain develops optimally during this period (American Academy of Audiology 2019).

Children who continue to be vulnerable to disorder despite early intervention may potentially be impacted by other contributing factors. Hartanto (2018) proposed that speech and language delays may arise as a consequence of secondary factors linked to various conditions, such as intellectual disabilities, autism spectrum disorders, cognitive impairments, physical disorders, mutism, psychosocial disorders, and bilingualism. Children first acquire language within the boundaries of their familial environment. They initiate the process of hearing and familiarizing themselves with their family's primary language, eventually acquiring the ability to speak the language (Alfin & Pangastuti 2020). Hence, the family serves as an external factor that significantly influences children, playing a pivotal role in shaping their language acquisition process. The approach in which the family encourages and nurtures language skills, especially during the period of growth and development, is of paramount significance. Insufficient stimulation from the family can impede children's language development, resulting in delayed linguistic abilities and impaired communication skills (Khoiriyah et al. 2016, Hurlock & Sijabat 2017).

This study found that there was a significant difference in the children's language development with regards to therapy duration. However, respondents who had a longer therapy duration exhibited a higher prevalence of being at risk compared to those who underwent therapy for a shorter duration. This observation underscores the importance of assessing the outcomes of auditory-verbal therapy not solely based on its duration but rather on its individualized effectiveness for each child (Heriyanti 2020). According to Jauhari (2020), the purpose of auditory-verbal therapy is to reduce children's dependence on lip reading and sign language. When children are diagnosed and treated late, it becomes challenging to ascertain the effectiveness of auditory-verbal therapy. Continuous monitoring is essential to evaluate whether the therapy is efficient in helping the participant attain language skills that are appropriate for their age.

Early diagnosis and active participation of family members can influence the outcomes of auditory-verbal therapy. However, the therapy outcomes can also be affected by other factors, including audiological management, the underlying causes of hearing loss, the degree of hearing impairment, the effectiveness of assistive devices, the emotional well-being of the family, and the competence of the therapist (Heriyanti 2020, Putri & Purbaningrum 2020). Furthermore, there are internal factors that have a significant impact, such as auditory potential, cognitive capacities, developmental stage, individual traits, learning preferences, and overall health. These factors pose a greater impact on the auditory-verbal therapy process, subsequently influencing the attainment of language skills in children (Wagino & Rafikayati 2013).

The active participation of the family is crucial, whereas a lack thereof may profoundly impact the outcomes of auditory-verbal therapy. The effectiveness of auditory-verbal treatment may be compromised if the family has not fully accepted their children's condition, as the emotional well-being of the family is crucial. Furthermore, various levels of intellectual abilities may lead to the children's different aptitudes to absorb all information and instruction provided in auditory-verbal therapy (Estabrooks et al. 2016). If parents fail to comprehend their children's learning style and the challenges, it can impact the effectiveness of auditory-verbal therapy. Therefore, parents must grasp how to create an enjoyable learning

environment for their children, which can enhance their receptiveness to the auditory-verbal therapy lessons (Putri & Purbaningrum 2020).

The age factor remains a significant aspect to consider when assessing the effectiveness of auditory-verbal therapy. This is due to the fact that intervention, such as hearing rehabilitation, has been proven to yield outcomes that are correlated with the age of the children (Aval et al. 2020). The advantages of the therapy may manifest as enhanced emotional well-being, social development, and language and speech skills. Empirical evidence has shown that auditory-verbal therapy yields favorable results even when applied to children older than 3 years. The speech and language abilities of the older children with hearing impairments can be comparable to those of typical-hearing children (Kaipa & Danser 2016, Baungaard et al. 2019).

This study did not find any significant differences in the development of social independence in relation to the children's age for early intervention ($p=0.111$) and therapy duration ($p=0.229$). This contradicts the findings of a study conducted by Hurlock & Sijabat (2017), who suggested that children with speech delays often struggle to achieve their desired independence. This difficulty arises from their limited verbal communication skills, which lead them to be perceived as too young or incapable of doing things independently. This can result in a continuous need for assistance from adults. Such dependency inhibits children from gaining self-confidence and developing independence. Early intervention and consistent therapy, on the other hand, can improve language development and enable children to better express their needs and wants (Hartanto 2018). According to the results of this study, the children's age for early intervention did not exhibit a significant difference in the development of social independence. This implies that other factors exert a more substantial influence on the development of children's social independence.

Prior studies conducted by Sa'diyah (2017) and Setyaningsih & Wahyuni (2018) revealed that the social independence of children is influenced by various factors, including parenting, gender, intelligence, environmental conditions, as well as socioeconomic and sociocultural factors. The process of developing social independence in children begins within the context of familial relationships, primarily with parents or caregivers at home. Children start to interact socially by engaging in play with others, mainly within the family circle. They instinctively begin to acquire the skills necessary for interacting with individuals beyond themselves, particularly those in their immediate surroundings. This process of social interaction gradually extends beyond the confines of the family home. Eventually, this progression extends to school environments, fostering the development of social independence.

As noted by Komala (2015), social independence in children is influenced by their familial upbringing, resulting in differences in independence levels between one child and another. The presence of other individuals in the vicinity of children can either facilitate greater independence or have the opposite effect. The home serves as the primary and fundamental educational environment, consequently placing the duty and responsibility on parents to establish the educational groundwork for their children. Parents must possess the capacity to implement the appropriate parenting style, as parenting errors can have profound and challenging consequences to rectify. For instance, authoritarian parenting can cause children to become overly reliant on their parents and fearful of interacting with others. Parents who are incapable of instructing their children to contribute to household chores or prepare for daily necessities hinder the children's ability to engage in vital activities that foster independence (Taryani et al. 2019). Children must acquire knowledge and life experiences in order to attain independence. This includes the imperative to establish connections with others, build relationships, acquire cultural knowledge, and develop the capacity to protect themselves from potential threats. This also illustrates that the duration of auditory-verbal therapy alone is insufficient to facilitate children's attainment of social independence. Children require opportunities for socializing beyond their homes, as they may feel isolated and different from their peers, leading to increased withdrawal from social engagements (Sarry & Ervika 2018).

The social and interactive skills of children, as well as their ability to navigate within society, are of great significance. Parents must cultivate self-confidence in their children by encouraging them to independently accomplish tasks during each auditory-verbal therapy session, which can foster a sense of capability in both parents and children. It is essential to cultivate a sense of consistent discipline and responsibility in completing a task to promote robust language development (Komala 2015, Heriyanti 2020). Additionally, a study conducted by Silalahi (2014) indicated that parenting style is characterized by a consistent and continuous pattern of behavior used in interactions with children. This pattern of behavior may be perceived in both positive and negative ways by the children. The different perspectives on parenting styles can serve as a stimulus that molds children's mindset and independence levels. According to Alini & Indrawati (2020), optimal development of children's

additional traits is contingent upon the presence of a strong parent-child bond and the implementation of appropriate parenting practices. By fostering healthy and supportive relationships, particularly through the practice of democratic parenting in daily life, it is anticipated that children's independence can be nurtured and their personalities shaped accordingly.

Strength and limitations

This research encountered several limitations, notably in terms of time and a relatively small sample size. The limited duration of interviews prevented the collection of in-depth information required to explore the specific aspects of parenting styles that might impact the children's development of social independence, as well as factors that could influence the effectiveness of auditory-verbal therapy. Furthermore, the small sample size restricted our ability to draw meaningful comparisons among children at various age groups, potentially affecting the research's overall findings. Nevertheless, this research offers valuable insights for medical professionals, parents of the respondents, educators, and therapists. It sheds light on the significance of early detection and appropriate interventions for children with sensorineural hearing loss who experience speech delays. This research emphasizes that the duration of auditory-verbal therapy does not inherently guarantee success in fostering language skills and social independence in children. Instead, it depends on the effective implementation of the therapy. While the findings revealed no correlation between the duration of auditory-verbal therapy and the development of social independence, this research can serve as a catalyst for future research. It is suggested that future researchdelve into factors that exert a more significant influence on the development of social independence in children with speech delay and sensorineural hearing loss, as well as factors that more effectively contribute to the success of auditory-verbal therapy.

CONCLUSION

Both the age for early intervention and the duration of auditory-verbal therapy exert a noteworthy difference in a child’s language development with speech delay and sensorineural hearing loss. However, the observed children did not experience a notable difference in the development of social independence concerning their starting age and therapy duration. Future research is recommended to use a larger sample size to facilitate more detailed comparisons of children's development across various age groups. Researchers and participants are encouraged to allocate a more extensive timeframe for a thorough investigation of factors affecting children's development of social independence. Future research may also include other aspects, such as parenting styles and factors influencing the efficacy of auditory-verbal therapy.

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Conflict of interest

None.

Ethical consideration

This research received approval from the Health Research Ethics Committee at the Faculty of Medicine, Airlangga University, Surabaya, Indonesia, under authorization number 164/EC/KEPK/FKUA/2022, dated August 23, 2022.

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Author contribution

ZIP was responsible for concepting and designing the research, analyzing and interpreting the data, drafting the article, providing final approval of the article, overseeing the provision of research materials or patients, and collecting and assembling the data. ACR was responsible for drafting the article, critically revising the article for important intellectual content, providing final approval of the article, and offering administrative, technical, and logistic support. AS was responsible for drafting the article, conducting critical revisions for important intellectual content, providing statistical expertise, and offering administrative, technical, and logistic support. NP was responsible for drafting the article, conducting critical revisions for important intellectual content, and providing administrative, technical, and logistic support. NDA was responsible for the final approval of the article and providing administrative, technical, or logistic support.

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