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Research article

THE ASSOCIATION BETWEEN PRENATAL EXPOSURE TO ENGLISH VOWEL-CONSONANT SOUNDS AND SPEECH DELAY AMONG CHILDREN AGED 2–3 YEARS IN THE DASAN TAPEN, GERUNG HEALTH CENTER, WEST LOMBOK¹

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Article Info	Abstract
<p>Article History: Diterima 25 Januari 2026 Diterbitkan 20 Maret 2026</p> <p>Key words: Prenatal auditory stimulation, speech delay, language development, child development, English phonetic sounds.</p>	<p>Background: Speech delay is one of the most common developmental disorders in early childhood and may negatively affect children's communication, social interaction, and academic readiness. Early language stimulation is essential to support optimal speech and language development. Prenatal auditory stimulation has been proposed as a potential early intervention to enhance fetal brain maturation and auditory processing. Exposure to structured English vowel and consonant sounds may improve auditory discrimination and strengthen neural pathways associated with language acquisition. Objective: This study aimed to analyze the relationship between prenatal auditory stimulation using English vowel and consonant sounds and the risk of speech delay in children. Methods: This quantitative study employed an analytical observational design with a cross-sectional approach. The study was conducted in the working area of Dasan Tapen Primary Health Center, Mataram, from January to March 2026. A total of 60 mothers with children aged 24–60 months were selected using purposive sampling. Data were collected using a structured questionnaire on prenatal auditory stimulation and child developmental screening using KPSP/DDST. Data were analyzed using the Chi-square test with a significance level of $p < 0.05$. Results: Among the respondents, 39 mothers (65.0%) reported providing prenatal auditory stimulation, while 20 children</p>

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(33.3%) were identified as having speech delay. Statistical analysis revealed a significant relationship between prenatal auditory stimulation and the risk of speech delay ($p = 0.012$). **Conclusion:** Prenatal auditory stimulation through English vowel and consonant sounds was significantly associated with a lower risk of speech delay in children and may serve as an effective early preventive strategy to support language development.

Keywords: prenatal auditory stimulation, speech delay, language development, child development, English phonetic sounds.

INTRODUCTION

Language development is a crucial aspect of early childhood development because it is closely linked to communication skills, social interactions, cognitive development, and future learning abilities. During the golden age, a child's brain experiences rapid development, so early stimulation significantly impacts their language and speech abilities. Language is the primary medium for children to communicate their needs, feelings, and thoughts to those around them. Therefore, delays in language development can have long-term impacts on a child's social, emotional, and academic development. (Putri and Muslam 2025)

Speech delay is one of the most common developmental disorders found in early childhood. This condition is characterized by a child's speech ability being below the average for their age, with developmental delays such as limited vocabulary, difficulty pronouncing words, articulation disorders, and delays in language comprehension. Children with speech delays generally experience difficulties communicating with others, resulting in low self-confidence, difficulty socializing, and learning difficulties at school. (Adhelia, Nugroho, and Iswantiningtyas 2015)

From a neuroscience perspective, a child's language development is greatly influenced by the function of the nervous system and brain development, particularly the left hemisphere, which plays a role in language processing. The brain is the control center for language, hearing, and speech. If there is a neurological disorder or a lack of stimulation during development, a child's

language skills can be impaired. Therefore, early language stimulation is a crucial factor in supporting a child's speech development.

Several studies have shown that speech delay can be caused by both internal and external factors. Internal factors include neurological disorders, prematurity, hearing loss, and genetics. External factors, meanwhile, relate to parenting styles, poor communication between parents and children, excessive use of gadgets, and a lack of language stimulation within the family environment. This lack of communication stimulation results in children having limited language reception and production, increasing the risk of speech delay. (Dhei Raro & Dhei Raro, 2023)

Advances in technology and science have shown that language stimulation can be provided not only after birth but also during the prenatal period. Fetuses are known to respond to sound as early as the second trimester of pregnancy through their developing auditory system. Fetal sound exposure is transmitted to the central nervous system and processed as early stimulation for brain development. This demonstrates that pregnancy is a crucial period for providing language and auditory stimulation as the foundation for early communication development in children.

One form of prenatal stimulation that is starting to receive a lot of attention is auditory stimulation using vowel and consonant sounds.

Consonants are a fundamental component in the development of human phonology and speech. In English learning, the pronunciation of vowels and consonants has diverse phonological characteristics, thus providing

more complex auditory stimulation for the development of children's hearing and language systems. (Putra and Damayanti 2023)

The use of English vowels and consonants as prenatal auditory stimulation is thought to help increase fetal hearing sensitivity to language sounds. Phonetic sounds such as /a/, /i/, /u/, and various consonant sounds in English can help stimulate early sound discrimination. The ability to distinguish language sounds is an important foundation for a child's receptive and expressive language development after birth. Furthermore, repeated phonological stimulation is believed to strengthen neuronal connections in brain areas related to language and communication. (Aziez, Aziez, and Pahu 2022)

In the study of English phonology, the ability to recognize and produce vowels and consonants requires good auditory stimulation from an early age. Previous research has shown that children who are accustomed to hearing spoken English from an early age have better pronunciation and sound processing skills than those who are not exposed to the language. Continuous repetition of vowel and consonant sounds can help form auditory memory in children's brains, facilitating language acquisition.

Although various studies have examined the factors causing speech delay and the importance of language stimulation in children, research on the relationship between prenatal auditory stimulation using English vowels and consonants and the risk of speech delay remains very limited, particularly in Indonesia. Most previous studies have focused on postnatal stimulation or speech therapy after a child experiences a speech delay. However, prenatal stimulation has the potential to be a preventative strategy that can be implemented during pregnancy to support a child's language development.

Based on this description, this study aims to analyze the relationship between prenatal auditory stimulation through English vowels and consonants and the risk of speech delay in children. This research is expected to contribute scientifically to the fields of child development and maternal health and serve as a basis for developing prenatal education regarding the importance of language

stimulation from the womb as an effort to prevent speech delay in children.

METHOD

This study used a quantitative research design with a cross-sectional approach to determine the relationship between prenatal auditory stimulation through English vowel and consonant sounds and the risk of speech delay in children. The cross-sectional approach was used because measurements of the independent and dependent variables were conducted simultaneously, allowing for a quick and efficient description of the relationship between the variables.

The study was conducted at The Dasan Tapen, Gerung Health Center, West Lombok from January to March 2026. The population in this study were all mothers with children aged 24–60 months. The research sample consisted of 60 respondents selected using purposive sampling technique based on predetermined inclusion and exclusion criteria.

Inclusion criteria for this study included mothers with children aged 24–60 months, willing respondents, and a history of normal pregnancies. Exclusion criteria included children with severe neurological disorders, congenital hearing loss, autism, or a history of congenital diseases that could affect the child's language development.

The independent variable in this study was prenatal auditory stimulation through English vowels and consonants, while the dependent variable was the risk of speech delay in children. Prenatal auditory stimulation was measured based on the frequency, duration, and consistency of maternal exposure to English vowels and consonants during pregnancy. The risk of speech delay was assessed using a child language development screening sheet based on age-appropriate speech development indicators.

The research instrument used a structured questionnaire comprising data on respondent characteristics, prenatal stimulation history, and observation sheets for child language development using the KPSP/DDST method. Prior to use, the

instrument underwent validity and reliability testing to ensure its appropriateness as a measurement tool. (Alwi Ibrahim 2024)

Data collection was conducted through direct interviews with the respondents' mothers and observations of their children's language development. The researcher first explained the purpose of the study, and then asked respondents to sign an informed consent form as a form of agreement to participate in the study. (Keperawatan et al., 2020).

The data obtained were analyzed using univariate and bivariate analyses. Univariate analysis was used to describe the frequency distribution of respondent characteristics, prenatal auditory stimulation, and the incidence of speech delay. Bivariate analysis used the Chi-Square test with a significance level of $p < 0.05$ to determine the relationship between prenatal auditory stimulation and the risk of speech delay in children.

This research has taken into account the principles of research ethics which include informed consent, confidentiality of respondents' identities, and the freedom of respondents to withdraw at any time during the research.

RESEARCH RESULT

Respondent Characteristics

Table 1. Distribution of Respondent Characteristics.

Characteristics	Frequency (n)	Percentage (%)
Mother's Age 20–30 Years	35	58,3
Mother's Age >30 Years	25	41,7
Secondary Education	38	63,3
Higher Education	22	36,7
Boys	34	56,7

Girls 26 43,3

Based on the table above, the majority of respondents (35 respondents) were aged 20–30 years, with 58.3% of the respondents having secondary education. The majority of mothers (38 respondents) had secondary education, and the majority of children (34 respondents) were boys.

Distribution of Prenatal Auditory Stimulation
Table 2. Distribution of Prenatal Auditory Stimulation

Prenatal Stimulation	Frequ ensi (n)	Percentag (%)
There is stimulation	39	65,0
No Stimulation	21	35,0

Based on table 2, it is known that most mothers provided prenatal auditory stimulation in the form of English vowel and consonant sounds during pregnancy, as many as 39 respondents (65.0%).

Distribution of Speech Delay Events

Table 3. Distribution of Speech Delay Risk

Speech Delay Risk	Frequency (n)	Percentage (%)
Speech Delay	20	33,3
No Speech Delay	40	66,7

Based on table 3, it is known that 20 children (33.3%) experienced speech delay, while 40 children (66.7%) did not experience speech delay.

The Relationship between Prenatal

Auditory Stimulation and the Risk of Speech Delay Table 4. The Relationship between Prenatal Auditory Stimulation and the Risk of Speech Delay

Prenatal Stimulation	Speech Delay	No Speech Delay	Total	p-value
There is stimulation	7	32	39	
No Stimulation	13	8	21	0,012
Total	20	40	60	

The results of the analysis using the Chi-Square test showed a p-value = 0.012 ($p < 0.05$), so there is a significant relationship between prenatal auditory stimulation through English vowel and consonant sounds and the risk of speech delay in children.

Children who receive regular prenatal auditory stimulation during pregnancy tend to have a lower risk of speech delay than those who do not. This study suggests that language stimulation during pregnancy can be a contributing factor to optimal language development in children.

Discussion

The study results showed that most mothers (65.0%) provided prenatal auditory stimulation in the form of English vowel and consonant sounds during pregnancy. This finding suggests that some respondents were aware of the importance of fetal stimulation, whether through sound, music, or verbal interaction. Repeated exposure to sound during pregnancy is believed to stimulate the development of the fetal auditory system and strengthen neural connections related to language.

This study also found that 33.3% of children experienced speech delays. This figure

indicates that speech delays remain a fairly common developmental issue in preschool-aged children. Speech delays can impact a child's ability to express needs, interact socially, and participate in learning. This finding aligns with numerous studies that indicate speech delays are one of the developmental disorders that most often cause concern for parents.

The bivariate analysis showed a p-value of 0.012 ($p < 0.05$), indicating a significant relationship between prenatal auditory stimulation and the risk of speech delay in children. Children who received prenatal stimulation had a lower proportion of speech delay compared to children who did not receive stimulation. This finding supports the hypothesis that language stimulation given in the womb can provide benefits to children's language development.

Biologically, these results can be explained by the development of the fetal auditory system, which begins to function from the second trimester of pregnancy. During this period, the fetus is able to detect and recognize sound patterns from the external environment, including the mother's voice and language sounds. Repeated exposure to vowel and consonant sounds can form early auditory memory and increase the brain's sensitivity to phonological patterns. Thus, the child has a better foundation for developing receptive and expressive language skills after birth.

The use of English vowels and consonants as a stimulus also has its own unique qualities. English has a greater variety of phonemic sounds than Indonesian, thus providing richer auditory stimulation. Research on phonology shows that recognizing vowel and consonant sound patterns aids sound discrimination and the development of children's phonological systems. (Putra and Damayanti 2023)

The findings of this study align with studies confirming that language development is strongly influenced by consistent parental stimulation. Structured verbal interaction can enhance receptive and expressive language skills, while a lack of communication can increase the risk of speech delay. Thus,

prenatal stimulation can be viewed as the initial stage of a language development process that continues after birth.

However, the results of this study should be interpreted with caution, as speech delay is a multifactorial condition. Other factors such as nutritional status, hearing loss, prematurity, parenting styles, intensity of postnatal interaction, and gadget use can also influence a child's speech development. Therefore, prenatal auditory stimulation should be viewed as a protective factor, not the sole determinant of language development.

Practically, the results of this study suggest that healthcare workers, particularly midwives, nurses, and health administrators, can incorporate education about prenatal auditory stimulation into antenatal care programs. Pregnant women can be encouraged to regularly listen to vowel and consonant sounds at a reasonable duration and intensity, accompanied by direct verbal communication with their fetus.

Overall, this study provides preliminary evidence that prenatal auditory stimulation with English vowel and consonant sounds is associated with a reduced risk of speech delay in children. These findings reinforce the importance of a promotive approach from pregnancy to support optimal child growth and development and could serve as a basis for further research with longitudinal or experimental designs.

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CONCLUSION

Based on the research results, it can be concluded that there is a significant relationship between prenatal auditory stimulation through English vowel and consonant sounds and the risk of speech delay in children aged 24–60 months ($p = 0.012$). Children who received regular exposure to vowel and consonant sounds during pregnancy showed a lower proportion of speech delay events compared to children who did not receive such stimulation. These findings indicate that language stimulation from in utero has the potential to be a promotive and preventive strategy to support

optimal child language development. However, a child's speech development is still influenced by various other factors, such as nutritional status, neurological conditions, parenting patterns, and postnatal stimulation, so prenatal auditory stimulation needs to be combined with care and an environment that supports the child's overall growth and development.

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