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A Prevalence of Phonological Disorder in Children with Specific Language Impairment

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***Abstract*—**Phonological disorder is a serious and disturbing issue to many parents and teachers. Efforts towards resolving the problem have been undermined by other specific disabilities which were hidden to many regular and special education teachers. It is against this background that this study was motivated to provide data on the prevalence of phonological disorders in children with specific language impairment (CWSLI) as the first step towards critical intervention. The study was a survey of 15 CWSLI from St. Louise Inclusive schools, Ikot Ekpene in Akwa Ibom State of Nigeria. Phonological Processes Diagnostic Scale (PPDS) with 17 short sentences, which cut across the five phonological processes that were examined, were validated by experts in test measurement, phonology and special education. The respondents were made to read the sentences with emphasis on the targeted sounds. Their utterances were recorded and analyzed in the language laboratory using Praat Software. Data were also collected through friendly interactions at different times from the clients. The theory of generative phonology was adopted for the descriptive analysis of the phonological processes. Data collected were analyzed using simple percentage and composite bar chart for better understanding of the result. The study found out that CWSLI exhibited the five phonological processes under investigation. It was revealed that 66.7%, 80%, 73.3%, 80%, and 86.7% of the respondents have severe deficit in fricative stopping, velar fronting, liquid gliding, final consonant deletion and cluster reduction, respectively. It was therefore recommended that a nationwide survey should be carried out to have national statistics of CWSLI with phonological deficits and develop intervention strategies for effective therapy to remediate the disorder.

***Keywords*—**Language disorders, phonology, phonological processes, specific language impairment.

I. Introduction

LANGUAGE is perhaps the most complex cognitive product possessed by humans. It is acquired within the first few years of life, regardless of the circumstances in which children grow up and to a great extent regardless of their intelligence as long as they are exposed to it, children learn language with ease if there is no hindrance such as disability. Vygotsky in Belsky [3] reported a strong correlation between language spoken or written and learning. This means that language is a unique human ability which is critical to child development. Language has a universally patterned or stages of development in its acquisition by children. A deviation in the language developmental milestone usually results in language disorder. Language disorder may occur at the level of phonology, morphology, syntax or semantics.

Language disorder according to Clark and Kamhi [5] is a significant delay in the use and/or understanding of spoken or written language. The disorder may involve the form of language (phonology, morphology and syntax), its content or meaning (semantics) or its use (pragmatics). It was also observed that language disorder is a neurodevelopmental condition with onset during childhood development. Language disorder is a problem that causes communication breakdown and makes it hard for someone to find the right words and form clear sentences when speaking. A child may have difficulty in understanding what others say or may struggle to put thoughts as words. Language disorder can either be acquired or developmental (congenital). An acquired language disorder, like aphasia shows up only after the person has had a neurological illness or injury which could be a stroke or traumatic head injury. A developmental language disorder is much more common in children. A child with developmental language disorders often starts speaking later than their peers. It is however important to note that this delay is not related to intelligence. In fact, children with developmental language disorders typically have average or above average intelligence. They usually have problems with receptive and expressive language skills before the age of 4 years.

Leonard [10] observes that potential causes of language disorders because language is a complex behaviour influenced by genetic, biological, perceptual, cognitive, linguistic, and environmental factors. Deficits in each of these areas have been linked to difficulties in language acquisition. However, our area of interest in this study is in the area of phonological disorder in CWSLI.

Belsky [3] observes that when children begin to speak in late infancy, they can only form single phonemes – for instance, they call their bottle *ba.* They repeat sounds that seem vaguely similar, such as calling their bottle *baba*, when they cannot form the next syllable of the word. Kelman [9] remarked that research has shown that learning words depends on phonological skills; therefore this has caused children who have phonologically based speech impairments to be susceptible to reading difficulties. It is against this background that this study was motivated to investigate the prevalence of the phonological deficits among children with SLI as the first step toward critical intervention. Therefore, the following research questions were set to direct the study.

II. Research Questions

1. What is the prevalence of phonological processes among children with SLI?

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2. What are the types of phonological processes found in children with SLI?
3. What is the degree of severity of the phonological processes among children with SLI?

III. Phonological Disorders

A phonological disorder is when a child has difficulty in organizing his/her speech sounds into a system of sound patterns. It is a speech sound disorder that affects a child at the phonological level. Spivey [15] says that the term phonological disorders refer to a child's difficulty in understanding the sound system and speech rules of a language that other children seem to acquire naturally. These disorders are broader in scope and more complex than simple articulation deficits. It is possible that a child who is deficit in phonology may pronounce a particular sound in a word clearly but cannot pronounce that same sound in another word. For example, the /s/ in 'sock' may be pronounced clearly, but the /s/ in 'bus' may be pronounced as 'bush'. Also, words with two fewer syllables – 'elephant', may be pronounced 'ephant'. At other times, a whole group of sounds may be mispronounced. For example, sounds like /s/, /f/, /ʃ/, /θ/, may be pronounced as /t/ i.e 'fire' becomes 'tire', 'shoe' becomes 'too', 'sun' becomes 'tun' and 'chin' becomes 'tin'. It is observed that phonological disorder occurs when a child does not develop the ability to produce some or all the sounds necessary for speech that are normally used at his/her age [1]. Phonological disorder is characterized by a child's inability to create speech at a level expected of his/her age group because of an inability to form the necessary sounds. Wagner, Torgesen and Rashotte [16] see phonological core deficit as difficulties which entails making use of phonological information when processing written or oral language.

Kelman [9] asserts that unlike an articulation disorder that represents difficulties with the production of individual speech sounds (i.e. phonemes), a phonological impairment is characterized by phonological deviations (e.g. Stopping, cluster reduction) that apply to an entire class of sounds. Kelman [9] adds that children with phonologically based speech errors often lack a strong base to differentiate between orthographic and phonological representations. These inadequate abilities are likely to continue throughout the school years unless they are addressed. Spivey [15] adds that often times a child who has phonological deficit leaves out sounds at the word final when talking. For instance, 'cook' – 'cooh', 'fuse' – 'foo' and 'bed'-'beh'. It is also interesting to know that this same child, when presented with those sounds he/she drops, (now) at the beginning or at the middle of other words, can pronounce them well.

IV. Phonological Processes in Children's Language Acquisition

During language development, some children have difficulties in acquiring or producing some sounds while others have difficulties in producing the whole word. As such, they tend to replace the easier sounds with the difficult ones or delete the sounds difficult for them. These normal speech errors are known as phonological processes in language development. Hanks [6] defines phonological processes as patterns of sound errors that typically developing children use to simplify speech as they are learning to talk. This error occurs because the ability to organize and coordinate the articulators – lips, tongue, teeth, palate and jaw for a clear speech is lacking. As a result of this, the complex sounds are simplified until when they are able to develop the coordination to articulate clearly. For example, consonant clusters may be reduced to a single consonant like 'pane' for 'plane', or deletion of the weak syllable in a word like 'banana' to become 'nana'. According to [2], "a phonological process is a mental operation that applies in speech to substitute for a class of sounds or sound sequences presenting a common difficulty to the speech capacity of the individual, an alternative class identical but lacking the difficult property."

Phonological process is a patterned modification of the adult speech system. Radford et al. [12] observed that after the child has acquired about 50 or so words, a sudden change often takes place. Children simplify their pronunciations and at the same time start acquiring a great many new words extremely quickly. Words which may have been pronounced correctly at first suffer those simplifications which are the phonological processes. In the opinion of [7], the general guideline for sound to be acquired and mastered is as follows:

36 months (3 years):	/n/, /m/, /p/, /h/, /t/
40-44 months (3.4-3.8 years):	/f/, /w/, /ng/, /b/, /g/
48 months (3.6 years):	/s/, /j/, /d/
48 plus months (up to 6 years):	/r/, /l/, /sh/, /ch/, /z/, /v/, /j/, /th/

V. Types of Phonological Processes

The following types of phonological processes were examined:

a. Fricative stopping – All fricatives are realized as stops found cross-linguistically in phonological acquisition. According to [2], in the acquisition data, fricatives are normally replaced by stops at the nearest place of articulation. Sound that stop airflow are easier to produce than the ones that impede it. Example /f/, /v/ are replaced by /p/, /b/ meaning that the fricative property is being simplified.
b. Velar fronting – Consonants produced at the further back of the oral cavity are substituted with those produced at the further front. Example /g/, /k/ are realized as /d/, /t/.
c. Final gliding – Liquid consonants example /l/, /r/ are replaced by glides ie /j/, /w/.
d. Final consonant deletion – The final consonants are often deleted or replaced with simpler ones. Clark [4] states that children often omit the final consonant or even final syllable if it is unstressed in their early words. Example [ti] for 'tick', [bu] for 'boot'.
e. Cluster reduction – This is a process whereby consonant combination or cluster are simplified at different positions in the word. Example 'top' for 'stop' or 'tick' for 'stick'.

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VI. Specific Language Impairment (SLI)

Specific Language Impairment is a developmental language disorder. Children with SLI usually have their main difficulty in the area of speech. Leonard [11] defines SLI as being applied to children who show significant deficits in language learning ability but age-appropriate scores on non-verbal tests of intelligence, normal hearing, and no clear evidence of neurological impairment. He observed that during the early years, children with SLI seem to be judged by adults as less capable, and they are less frequently sought out as play mates by other children.

Ramus et al. [13] observed that SLI manifests itself as a difficulty in acquiring language despite otherwise normal intellectual functioning, normal hearing and an adequate learning environment. Children with SLI have deficits in syntax, morphology, phonology and the lexicon, although the precise characteristics of these deficits differ cross-linguistically. Nicolielo and Rocha [8] add that SLI is a persistent alteration during the stage of language development, being identified when there is at least a 12 months delay in relation to expressive language, six months in relation to perceptive, a difference of 12 months between mental and linguistic ages and performance IQ higher than 85. These characteristics occur in the absence of neurological lesion, motor deficiency or behavior in the autism spectrum.

The term specific does not mean that the child would not possess other cognitive difficulties. In general, they do possess them, however, in a lesser degree than the language difficulties. Savage [14] remarked that the larger body of research posits that SLI occurs in the absence of cognitive impairment, physical impairments such as blindness or deafness or other confounding environmental factors. He adds that the profile of people with SLI is heterogeneous because the etiology of the disorder is yet to be known. On the surface, however, the generally understood characteristics of SLI are abnormal acquisition of grammar and vocabulary as well as difficulty in the domain of phonology.

VII. Methodology

The study is a survey of 15 children with SLI between the ages of 9 years and 12 years in St Louise Inclusive Schools, Ikot Ekpene in Akwa Ibom State, Nigeria. The research instrument used for the collection of data is PPDS with a reliability coefficient of 0.74 obtained from test re-test method of reliability. The scale comprise of 17 sentences that cut across the five phonological processes under investigation. The sentences were given to the client to read with emphasis on the words that contain the targeted processes. Those who were not able to read by themselves were asked to repeat the sentences after the reading for them. Observational techniques through friendly conversation and interactions with the sample were used in identifying the phonological disorder present. A tape recorder and a head set to record their utterances. The researcher employed the Praat software analysis for the description of the sounds for a quantitative analysis of the data collected.

VIII. Presentation of Results

The presentation of the result of the analysis is done using the descriptive statistics of simple percentage and simple bar chart. For a better understanding, the presentation will be done according to the research questions.

Research Question 1. What is the prevalence of phonological processes among children with SLI?

To answer research question one, examination of the subjects of the study was analyzed using frequency count to identify those with and without phonological processes. It was observed that all the children examined (100%) have phonological deficit. This implies that all the children with SLI in the study area have phonological deficit of one form or the other. Meanwhile, the type and the degree of the problem vary in terms of severity.

Research Question 2. What are the types of phonological processes found in children with SLI?

Using the Praat computer analysis method, the five types of phonological processes were clearly brought out. The result is therefore presented in Table I.

TABLE I
Prevalence of Types of Phonological Processes among Children with SLI

	Fricative stopping	Velar fronting	Liquid gliding	Final consonant deletion	Cluster reduction
N	15	15	15	15	15
%	100%	100%	100%	100%	100%

Table I show that all the subjects in the study exhibit all the types of phonological processes examined. This implies that all children with SLI under investigation have the five types of phonological processes examined.

Research Question 3. What is the degree of severity of the phonological processes among children with SLI?

TABLE II
Prevalence in Degree of Severity of the Phonological Processes among Children with SLI

S/N	Phonological Deficits	Mild N %	Moderate N %	Severe N %
1.	Fricative stopping	4 26.7%	1 67.0%	10 66.7%
2.	Velar fronting	- -	3 20.0%	12 80.0%
3.	Liquid gliding	1 6.7%	3 20.0%	11 73.3%
4.	Final consonant deletion	- -	3 20.0%	12 80.0%
5.	Cluster reduction	- -	2 13.3%	13 86.7%

Table II reveals the prevalence in degree of severity of the phonological processes. This table shows that the majority of the children have severe phonological processes. This is indicated by the percentages which are 66.7%, 80%, 73.3%, 80% and 86.7% for fricative stopping, velar fronting, liquid gliding, final consonant deletion and cluster reduction, respectively. This is further explained in Fig. 1 showing the analysis in bar chart for validity. The colors show the level or degree of the prevalence. It can therefore be inferred that within the study area, an average of 70% of children with SLI has severe phonological processes.

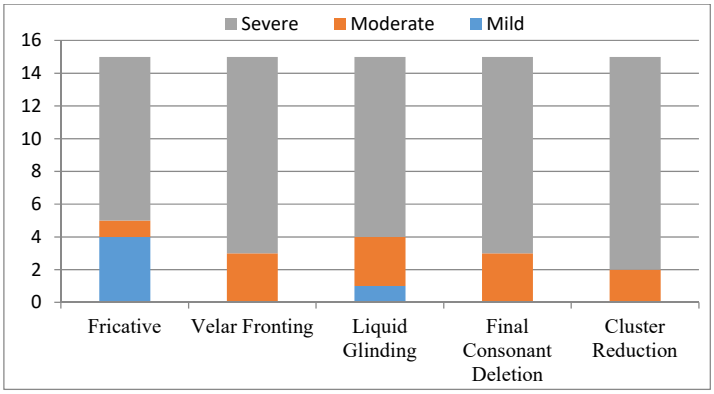

Fig. 1 Prevalence of the degree of severity of phonological processes among CWSLI

IX. Conclusion

The revelation from this study is that an average of 70% of children with SLI in St. Louise Inclusive Schools, Ikot Ekene, Akwa Ibom State have severe phonological deficit of fricative stopping, velar fronting, liquid gliding, final consonant deletion and cluster reduction.

X. Recommendations

The following recommendations were therefore made based on the conclusion of the findings of the study.

1. Speech and language therapist should develop more critical interventions for severe phonological deficit for children with SLI.
2. Government should conduct a national survey of the prevalence of phonological deficit of school children for proactive intervention.

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