EFFECT OF SPEECH SPOON KIT FOR PRODUCING PHONEMES AMONG CHILDREN WITH HEARING IMPAIRMENT

SUBMITTED BY

SARANYA DEVI S

(Reg. No. 20PSE012)

Under the Guidance of

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(Assistant Professor (SG))

DEPARTMENT OF SPECIAL EDUCATION

THESIS SUBMITTED TO THE

AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN,

Coimbatore-641043

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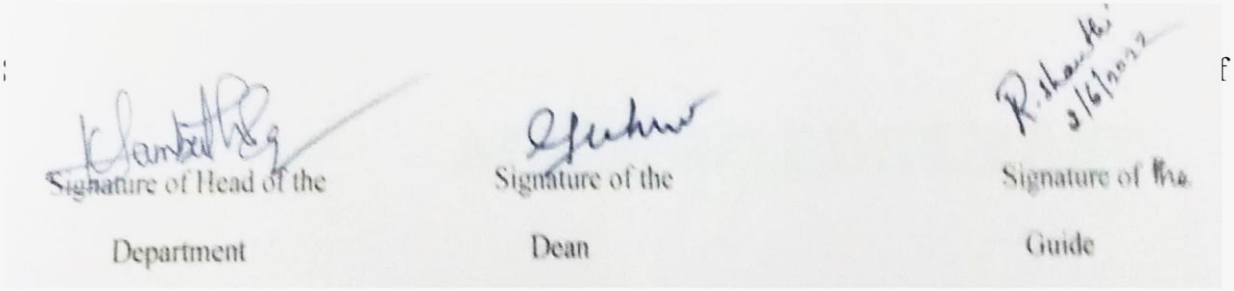
CERTIFIED AS A BONAFIDE RESEARCH WORK



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S.SARANYA DEVI

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LIST OF ABBREVIATIONS

SSK	Speech Sppon Kit
CWHI	Children With Hearing Impairment
SHL	Severe Hearing Loss
PHL	Profound Hearing Loss

INTRODUCTION

CHAPTER I

CHAPTER -I

INTRODUCTION

1.0. INTRODUCTION

Hearing loss is a global issue with greater than 1.5 billion people experiencing varying degrees of hearing loss, for this out of which 430 million are with moderate to profoundly severe hearing loss in the better hearing ear (World Health Organization, 2021). In 1997, the World Health Organization (WHO) reported a 6.3% incidence of disabling hearing loss (DHL) in India. In children, the prevalence of hearing loss was increased from 76.5 million (6.6%) in 2008 to 100 million (16.47%) in 2018 (Verma et al., 2021; MOSPI Report, 2022). WHO also notes that an annual cost of $ 980 billion is incurred related to health care, education, productivity losses, and societal costs related to hearing loss. Hearing loss can negatively impact day-to-day activities of the person. The ability to communicate influences interrelationships, mental health, education, and employment of the person. Hearing loss can also cause low self-esteem, is often associated with stigma, and can significantly impact the families and communication partners of those living with the condition.The impact on a person with hearing loss is not only the inability of the individual to speak, but includes whether it is addressed through effective clinical or rehabilitative interventions, and his ability to cope up with his environment to fulfill his needs. These primary concerns can be mitigated by improving the ability of the person to speak. Hence, effective interventions are essential in mitigating these costs.

Speaking is the ability of an individual to express their thoughts through articulate sounds. Speech is human vocal communication used in a structured way to convey points and messages. In the case of persons with only hearing loss, speech will not only help them to communicate their needs, but also help them live in the society in a respectful manner. It permits them to form relationships, take part in decision making, and live like normal persons. Without communication skills, the ability to progress in the working world and in life, itself, would be nearly impossible.

Each language has phonetic combinations of vowel and consonant sounds that form the sound of its words, and uses those words in their semantic. The production of speech sounds involves

functional parts such as respiration, phonation, articulation, resonation, and regulation. In this study, we developed a speech spoon kit among for producing phonemes among children with hearing impairment.

Speech disorders are problems associated with making sounds. It includes the following types of disorders.

- ***Articulation disorders*** focus on errors with making sounds in syllables, or saying words incorrectly, distortions and substitutions, where the listeners cannot understand. Pronunciation errors and confusion of phonemes are some of the errors that result from articulation disorders (Maier et al., 2009). The types of speech sound disorders are*Organic* - due to structural abnormalities such as cleft lip and palate, hearing impairment or brain injury.
- *Functional* - having difficulties in making specific speech sounds.
- *Developmental phonological* - having difficulties with appropriate speech patterns (tar for car)
- *Developmental apraxia* - having difficulties planning and coordinating lips, tongue and jaw to produce speech sounds.
- *Developmental dysarthria* - having lack of strength and muscle control.

Fluency disorders focus on problems with normal fluency and flow of speech. Stuttering is one such problem where interruption of flow of speech with unusual stops, partial-word repetitions ("b-b-boy"), or prolonged sounds and syllables (sssssnake) are common.

Resonance / Voice disorders result indistracting the listeners from what's being said because of the pitch, volume, or quality of voice. The child also may feel pain or discomfort when speaking.

Speech therapy assesses and treats speech disorders and communication problems. Speech therapy might be needed for persons with hearing impairments, weak oral muscles, and cognitive or other developmental delays. Speech therapy involves four processes, viz., initiation, phonation, oro-nasal process and articulation. It helps in the holistic development of persons with hearing impairment as it improves their communication skills, enhances social skills, enables them to cope up better with society and function in day-to-day life. Such interventions should be started as early as diagnosis is made. Speech

1.1 Need and Significance of the study

Persons with hearing impairment lack the development of speech and language. They face the hurdles of communication, language development, and other social and economic difficulties. The difficulties faced by persons with hearing impairment are as follows.

1. Difficulties in learning speech sounds.
2. Hard to develop speech.
3. Delayed language development.
4. Social withdrawal due to reduced access to services.
5. Stigma and discrimination by society.
6. Emotional problems caused by reduced self-esteem and confidence.
7. Slow learning ability.
8. Lack of information due to lack of communication.

For the above mentioned reason, the children with hearing impairment production of phonemes as speech is more important for better communication so that the importance of speech is given below:

- Speech is the production of a sequence of sounds that make up words. Children learn how to use speech sounds by listening to the sounds they hear in the languages around them.
- Children start by using babbled sounds and then progress to using sounds in words, sentences and conversation.
- Speech sounds develop gradually-from birth to the child's seventh or eighth year. It is best to think about sound development in terms of age ranges rather than specific ages.
- This research focuses on children with hearing impairment speech to develop production of speech sounds..
- The first is analyzing the production of phonemes among children with hearing impairment and to assess whether they are using existing tools like Erber and Articulatory battery tool,14 phonemes in an effective manner.

- Speech production is the process of uttering articulated sounds or words, identifying how humans generate meaningful speech.
- It is a complex feedback process in which hearing, perception and information processing in the nervous system and brain are involved.

This study helps to find out whether:

- Children with hearing impairment are able to produce phonemes.
- Children with hearing impairment speech performance level will be analyzed through existing tools Erber and Articulatory battery tool.

1.2 Statement of the Problem

The title of the study is entitled **as "Effect Of Speech Spoon Kit for Producing Phonemes among Children With Hearing Impairment**"

1.3 Terminology

1.3.1 Hearing Impairment

The term 'hearing impaired' is used to describe persons with any degree of hearing loss, classified as mild, moderate, severe and profound. The definition of hearing disabled as stipulated in the PWD Act, 1995 is a person who has a minimum of 60dB of hearing impairment in the better ear in speech conversation frequencies.

1.3.2 Cochlear Implant

A cochlear implant is a surgically implanted neuroprosthesis, a small, complex electronic device that provides perception of sound for improved speech understanding. An organization for Deaf culture in the United States stated that it can help profoundly deaf or severely hard-of-hearing by providing a sense of sound. The implant consists of two parts, an portion that sits behind the ear externally and another portion that is placed under the skin surgically. The implant has the following parts:

- A microphone, to pick up sounds from the environment.
- A speech processor, to select and arrange sounds picked up by the microphone.

- A transmitter and receiver/stimulator, to receive signals from the speech processor and convert them into electric impulses.
- An electrode array of a group of electrodes to collect the impulses from the stimulator and send them to different regions of the auditory nerve.

Normal hearing is not restored by an implant. Instead, it can help a deaf person to understand speech through a representation of sounds in the environment.

1.3.3 Phonemes

A phoneme is any perceptually distinct unit of sound in a specified language that makes it different in its pronunciation and its meaning from another word. Each single speech sound, which distinguishes meaning, is called a phoneme. **(**Wells 1982)

Phonology is the system of contrasting relationships among the speech sounds and patterns of speech sound in a language, and constitute the fundamental components of a language. This is also considered a branch of linguistics that studies the system of sounds.Phonetics is the branch of linguistics that studies the characteristics of speech sounds, and how it is produced, conveyed and perceived, or in the case of sign language, the equivalent aspects of a sign. It studies about three aspects:

➢ Articulatory phonetics: The way speech sounds are produced

➢ Acoustic phonetics: The way speech sounds are traveled in the air

➢Auditory phonetics: The way speech sounds are perceived by the ear

1.3.3. Phonation

Phonation is the process by which vocal folds produce or utter speech sounds through quasi-periodic vibration. It refers to the production of voice by exhalation of air from the larynx due to vibration of the two vocal folds, essential for normal speech and singing. Phonation begins with air flowing from the lungs, setting the focal folds into motion, and generating a glottal sound. **(**Crystal, David 1997**)**

1.3.5.Articulation

Articulation is the act or process of physically producing speech sounds. The position of speech organs to create distinctive speech sounds. The way in which these speech organs are making contact while making a sound is important to ensure fluency, complexity, accuracy, and comprehensibility in speech.

1.3.5.1 Place of Articulation

The place of articulation refers to that area in one of the resonating cavities (larynx, mouth) where the articulators are opposing some kind of stricture or obstacle to the passing of air. In articulatory phonetics, the place of articulation is also known as the point of articulation. In consonant sounds, the point of contact of articulators will have an obstruction in the vocal tract between active articulators and passive articulators. Place of articulation denotes the part of active articulators and passive articulators that come in contact with each other.

➢ **Bilabial:** Bilabial sounds are produced by upper lip and lower lip comes in contact with each other. Bilabial consonants occur when you block/constrict airflow out of the mouth by bringing your lips together. English contains the following three bilabial consonants:

- /p/ as in “purse” and “rap“
- /b/ as in “back” and “cab“
- /m/ as in “mad” and “clam“

➢ **Labio-dental:** Labio-dental sounds are produced when lower lip(labial) touches the upper teeth(dental). Labio-dental consonants occur when you block/constrict airflow by curling your lower lip back and raising it to touch your upper row of teeth. English contains the following two labio-dental sounds:

- /f/ as in “fro” and “calf“
- /v/ as in “vine” and “have”

➢ **Dental:** Dental sounds involve the tip of the tongue articulated with the rim of the upper teeth to form a constriction. Dental consonants occur when you block/constrict airflow by placing your slimy tongue against your upper teeth. English contains the following two labio-dental sounds:

- /θ/ as is “thick” and “bath“
- /ð/ as in “the” and “rather”

➢ **Alveolar:** The tip of the tongue touches the flat part of the alveolar ridge (the part immediately behind teeth). The alveolar ridge is where your teeth meet your gums. You create Alveolar consonants when you raise your tongue to the alveolar ridge to block or constrict airflow. The English alveolar consonants are as follows:

- /n/ as in “no” and “man“
- /t/ as in “tab” and “rat“
- /d/ as in “dip” and “bad“
- /s/ as in “suit” and “bus“
- /z/ as in “zit” and “jazz“
- /l/ as in “luck” and “fully”

➢ **Post-Alveolar:** When you retract your tongue back just a bit from the alveolar ridge, the sounds change enough to be recognized as distinct consonants. So post-alveolar consonants are those that occur when the tongue blocks or constricts airflow at the point just beyond the alveolar ridge. The post-alveolar English consonants are as follows:

- /ʃ/ as in “shot” or “brash”
- /ʒ/ as in “vision” or “measure”
- /tʃ/ as in “chick” or “match”
- /dʒ/ as in “jam” or “badge“

➢ **Retroflex:** Retroflex sounds are produced when the tip of the tongue is raised and curled to touch the centre of the hard palate. For example, [/t/ as 'topi' and /d, th, dh / in Hindi].

➢ **Palatal:** These sounds are produced by lifting the front of the tongue to the hard palate. The roof of your mouth is the *hard palate*. You may know it as "the place that burns like hell when I eat pizza that is too hot." You create Palatal consonants when you raise the tongue to this point and constrict airflow. English has only one palatal consonant:

- /j/ as in "yes" and "bayou"
- /dz/ as in "judge"].

➢ **Velar:** Velar sounds are made when the back of the tongue raises towards the soft

palate(velum). Behind your hard palate you have the *velum* or *soft palate.* Unlike the bony hard palate in front of it, this consists of soft, mucous tissue. You make Velar Consonants when you raise the back of your tongue to the velum to block or restrict airflow. English has the following velar consonants:

- /ŋ/ as in "going" and "uncle" (note that the 'n sound' in these words is NOT made at the alveolar ridge, which is why it is distinct from /n/).
- /k/ as in "kite" and "back"
- /g/ as in "good" and "bug"
- /w/ as in "wet" and "howard"

➢ **Glottal:** The articulators involved are two vocal folds (i.e. vocal cords). It acts as a sort of bottle cap to your windpipe. Inhale and then hold your breath for a few seconds while keeping your mouth open. What you are actually doing to keep the air from expelling out of your lungs by closing your glottis. Glottal consonants aren't actually consonants; they just play consonant roles in the language. In English, the following things happen at the glottis:

- /h/ as in “hi” and “Bahamas.” Say these words and notice how you’re not actually constricting or blocking airflow for this /h/ sound. You’re just exhaling a little bit harder than you would for a normal vowel sound in *transition* to the following vowel sound.

  for example, in the phrase “wha(t) time is it?” the /t/ in “what” is dropped and the vowel sound before it is closed at the glottis.

1.3.5.2. Manner of Articulation

The manner of articulation refers to the way the articulators are set so that the resonance effect is possible. The manner of articulation refers to the description of how the sounds are made i.e., the way in which the air stream is obstructed and how the air is released from the vocal tract.

➢ **Plosive or stop:** A sudden release of air flow by raising the velum and with a complete closure in the vocal tract. Sounds like /p, b, t, d, k, g/ are produced.

➢**Nasal:** The velum is lowered during the nasal sound by releasing the airflow through nasal cavity with a complete closure in the vocal tract. Sounds like /n, m/ are produced.

➢**Fricatives:** Forcing air through narrow passage under a considerable pressure by bringing two articulators closer. Sounds like /f, v, s, z, ʃ, ʒ, h, θ, ð/ are produced.

➢**Affricates:** These sounds are made up of plosive and fricative followed together to form [ch as chin and dz as jug]

➢**Flap (tap):** A single alveolar stop with a very short duration for the closure. Active articulator comes in contact with passive articulation and releases a tap sound.

➢**Lateral (Approximants):** Lateral sounds consists of half consonants and half vowels characteristics like /l, r/.

➢ **Semi-vowel:** These sounds are produced when articulators move from one place of articulator to another. They are also called glide sounds. They are /w, j/

1.3.6 Respiration

Respiration is the movement of oxygen from the outside environment to the cells within the tissues, and removal of carbon dioxide from the cells. When we inhale for a longer time, the more words that we can produce within a given time (Hinic-Frlog, 2019).

1.3.7 Respiration and Speech Production

Words begin from the mouth to the lungs traversing through the respiratory tract. Nasal and pharyngeal larynx are the most important parts of the upper respiratory tract. The lower respiratory tract, formed by trachea,twobronchi,the rib cage, diaphragm and the lungs plays an important role in the effective development of speech. Exhalation and inhalation are the most important in the speaking process. Speech is formed during the process of expelling air rather than the process of inhaling.

1.3.8 Resonation

Resonance is the shaping of the airflow for speech through the oral (mouth) and nasal (nose) cavities. Resonation happens in the upper portion of the vocal tract, starting from above the larynx. When the tones from the larynx are resonated with the pharynx, it is recognized as a human voice. The process of resonation allows us to produce different vowels to resound, to act as a resonator, exhibit resonance, to amplify vocal sound by the sympathetic vibration of air in certain cavities and bony structures, and to cause it to resound.

1.3.9.Regulation

Speakers generate a variety of gradient phenomena in their mental and linguistic behaviour. The naturally induced variability is the result of regulation that underlie speech production and the perception of the speaker’s linguistic behaviour. (Mücke et al., 2017)

1.3.10. Attentiveness

Attentiveness is the action of paying close attention to something. The persons with hearing impairment have to be attentive to the speaker. Many listeners with sensorineural hearing loss have uneven hearing sensitivity across frequencies. So, persons with hearing impairment may lose focus in selective frequencies.(Abraham K Paul. 2011)

1.3.11. Early identification

Early detection of hearing loss before the infant is six months old can prevent further disabilities in speech, language and cognition in the child's development (National Research

Council (US) Committee on Disability Determination for Individuals with Hearing Impairments, 2004).

1.3.12. Degree of hearing loss

Hearing loss can be classified by their hearing level such as mild, moderate, moderately severe, severe or profound hearing loss based on the frequency between which they are able to hear(Clark, J. G. (1981*)*

Degree of hearing loss	Hearing loss range [dB HL]
Normal	from –10 to 15dB
Slight	From 16 to 25dB
Mild	from 26 to 40dB
Moderate	from 41 to 55dB
Moderately severe	From 56 to 70dB
Severe	from 71 to 90dB
Profound	91+dB

1.3.13. Conductive hearing loss:

The outer or middle ear is damage, this denoting conductive hearing loss .which prevents sound from entering the middle ear**.**

1.3.14. Sensorineural hearing loss:

The damaged inner ear. The problem in entering sounds and transmitting sounds signals to the brain.

1.3.15.Mixed hearing loss:

Mixed hearing loss refers to a combination of conductive hearing loss and sensorineural hearing loss.

1.3.16.Speech therapy

Speech therapy is a remediation that examines speech disorders to assess and treat them. It is carried out by therapists with expertise and knowledge of various tools to assess the persons with hearing impairment to understand the kind of speech disorder associated with each person.

A speech journal can be designed to allow parents and speech pathologists the ability to create customized versions of any targeted speech-language activity.[Charles Larson.2019].

1.4 Objectives of the Study

- To explore production of phonemes among children with hearing impairment.
- To use existing tools [erber and articulatory battery ,14 phonemes] to test the production of phonemes among children with hearing impairment.
- To develop instructional package for producing the phonemes among children with hearing impairment.
- To enhance the production of phonemes through SSK among children with hearing impairment.
- To find the impact of SSK in production of phonemes among children with hearing impairment with respect to variables
  - Gender
  - Age
  - Locality
  - Types of amplification devices.

1.5Hypothesis of the study

- There is no significant difference among children with hearing impairment before and after intervention of Speech Spoon Kit for production of phonemes.
- There is no significant difference in the usage of existing tools like Erber,Articulatory Battery and 14 Phonemes, to test the production of phonemes among children with hearing impairment before and after intervention of Speech Spoon Kit.
- There is no significant difference between in production of phonemes among children with hearing impairment before and after intervention of Speech Spoon Kit with reference to
  - Gender
  - Age
  - Locality
  - Types of amplification devices.

1.6 Scope of the study

- To understand about speech phonemes.
- To give awareness and develop speaking skill in children with hearing impairment

- To develop a speech spoon tool for children with hearing impairment.
- Helps the hearing impaired children to express their thoughts through speech.
- By allocating time in therapy sessions will improve the children's speech production skills..
- Enhance the way of interaction for children with hearing impairment.
- Helps the hearing impaired children to communicate effectively and produce phonemes.
- Helpful peer group to maintain rapport with their hearing impaired friends.

1.7 Limitations of the study

The limitations of the study are as follows.

- The study was administered only to the inclusive schools and special school.
- The study was conducted the limited district area.
- The study was carried out only for children with hearing impairment at primary level.
- The study was carried out only for children between the age group of 5 to 18 years.
- Find out the error of articulation especially in children with hearing impairment under the area of SODA only (Substitution, Omission, Distortion , Addition) .
- The sample size is limited.

1.8 Organization of the study

The study "**Effect of Speech Spoon Kit for Producing Phonemes among Children with Hearing Impairment**" is organized in five chapters.

- The first chapter presents the introduction, need and importance of the study, statement of the problem, definitions of key terms, objectives, hypothesis of the study, scope of the study and limitations of the study.
- The second chapter includes review of related literature to the present study.
- The third chapter includes the method of the study undertaken for the present study.
- The fourth chapter presents the detailed analysis on the data collected from the sample.
- The fifth chapter deals with the summary of the findings, discussion, recommendations, suggestions and conclusions.

LITERATURE REVIEW

CHAPTER - II

REVIEW OF RELATED LITERATURE

2.0 Introduction

2.1 Purpose of Literature Review

2.2 Studies related to Speech Development

2.3. Studies related to Phonemic Awareness

2.4. Studies related to Phonological Development

2.5. Studies related to Phonological processes in Children with Hearing Impairment

2.6. Studies related to Speech kit

2.7. Studies related to Articulation

2.8. Conclusion

CHAPTER II

REVIEW OF LITERATURE

2.0 Introduction

Literature reviews are critical evaluations of material that has already been published. These papers can be qualitative or quantitative articles. We need to identify and synthesize relevant literature to evaluate a specific research question, substantive domain, theoretical approach, or methodology and thereby provide readers with a state-of-the-art understanding of the research topic. Many of these benefits are highlighted in Hanssens' (2018).

When we produce a literature review, we use clear step-by-step ways so that others could follow to find the information they need and find its strengths and weaknesses. We try to find links that tie different papers together, to summarize the research output in a particular field of study. We also have to narrow down to what we use in our study and how the reviewed papers are helpful in our research.

The purpose of and contributions associated with review papers can vary depending on their specific type and research question, but in general, they aim to

- Resolve definitional ambiguities and outline the scope of the topic.
- Provide an integrated, synthesized overview of the current state of knowledge.
- Identify inconsistencies in prior results and potential explanations.
- Evaluate existing methodological approaches and unique insights.
- Develop conceptual frameworks to reconcile and extend past research.
- Describe research insights, existing gaps, and future research directions.

To provide a sufficient contribution, the literature review needs to achieve three key standards. First, the research domain needs to be well suited for a review paper, such that a sufficient body of past research exists to make the integration and synthesis valuable—especially if extant research reveals theoretical inconsistencies or heterogeneity in its effects. Second, the paper must be well executed, with an appropriate literature collection and analysis techniques, sufficient breadth and depth of literature coverage, and a compelling writing style. Third, the manuscript must offer significant new insights based on its systematic comparison of multiple studies.

Identify the connections between the papers to uncover incremental insights, each of which takes time to detail and explicate.

The increasing methodological rigor and technical sophistication of many marketing studies also means that they often focus on smaller problems with fewer constructs. Thus, good literature review provides a solid platform for future research, in the reviewed domain but also in other areas, in that researchers can use a good review to learn about and extend key insights to new areas.

Literature review process followed in this research

With all the powers of search engines like Google at the fingertips, the process of searching a journal article is not difficult. We can start with the exact title of the search, such as “phonemes", or “hearing impaired”, “producing speech for hearing impaired”, “articulation parts”, “interventions for hearing impaired”, or slight variations of these words. The number of relevant results using Google Scholar can then be filtered by selecting the recent years of publication. Though the approach is time consuming, we can narrow down relevant articles by reading the abstracts. This is the method called ‘building blocks method’ noted by Goodman et al. (2014).

Once we have articles relevant to our research, we can start exploring the References found in these articles using the snowball method as noted by Goodman et al. (2014), to narrow our search to identify articles that explore our research area. Using basic boolean operators in the such as the AND, OR, NOT in the Google Scholar, we can combine the operators with logical combinations of the Select Fields, along with the key words preselected after skimming through articles from Google Scholar. We will be able to identify the most relevant articles.

2.1 Purpose of literature review

➢ Identifies gaps in theories

➢ Helps to avoid repeating the same intervention used in the research which already conducted on a topic

➢ Identify new ways to interpret the previous researches

➢ Identify the areas of prior researches to prevent duplication of effort

➢ Provide knowledge about methods and standardized tools can be supported to our research

➢Sets the background on what has been explored on a topic so far

➢ Provide the intellectual context of the new study and position of this research with other related research

In this chapter it reveals about the literature related to the title and it was coated under following headings.

❖ Studies related to Speech Development

❖ Studies related to Phonemic Awareness

❖ Studies related to Phonological Development

❖ Studies related to Phonological processes in Children with Hearing Impairment

❖ Studies related to Speech Kit

❖ Studies related to Articulation.

2.2 Studies related to Speech Development

Mahshie, J. J., Alquist, D. V., Smith, B. W., and Bernstein, E. A., (2002) have done research on "Speech training aids for hearing-impaired individuals". The pattern decided on for this is to take a look at five profoundly deaf youngsters. Preliminary assessment of two associated laptops primarily based totally on speech education and exercise aids for profoundly deaf youngsters became conducted. The Speech Training Station (STS) makes use of each acoustic and physiological transducer for evaluation and education in a college or medical institution. The Speech Practice Station (SPS) makes use of the acoustic signal, and was designed in most cases to be used inside the home. A collection of video games and sports became implemented on the two systems. Use of the STS became evaluated via means of 2 speech clinicians throughout a 15-month period. Fifteen youngsters have been topics with inside

the assessment. The resource became discovered to be easily integrated into medical institution sports and beneficial for analysis and therapy. The SPS became evaluated throughout a 1-to-2-week period, throughout which it became positioned with inside the houses of decided on samples. Using an interest log and questionnaire finished via means of the youngsters'' parents, usage records and impressions have been obtained. Potential cost and troubles with such aids are discussed.

Laurie S Eisenberg, Karen C Johnson, Amy S Martinez, Carol G Cokely, Emily A Tobey, Alexandra L Quittner, Nancy E Fink, Nae-Yuh Wang, John K Niparko[2006] studied **"Speech recognition at 1-year follow-up in the childhood development after cochlear implantation study: methods and preliminary findings".** The Childhood Development after Cochlear Implantation (CDaCI) examination is a longitudinal multicenter research designed to discover elements influencing spoken language in younger deaf kids with cochlear implants. As a part of a complete assessment battery, a speech reputation hierarchy was designed to evaluate how well those kids understand speech stimuli throughout developmental stages. Data had been analyzed for the earliest measures in forty two pairs of kids accomplishing 1-12 months of follow-up. Some of the kids within the cochlear implant organization who met standards for checking out approached stages of overall performance just like the normal-hearing controls, and a few of them discovered sentences in competition. These outcomes reveal the responsiveness of the speech reputation hierarchy in monitoring emergent abilities from a pattern of the CDaCI cohort.

Eisenberg, and Laurie S (2007) studied **the "Current State of Knowledge: Speech Recognition and Production in Children with Hearing Impairment".** This evaluation summarizes the literature protecting speech popularity and production in kids with moderate-to-intense hearing impairment (HI). In general, the potential to bring speech improvements as the kid matures however decreases with more severity of hearing loss. Performance ratings on measures of phonetic evaluation belief and phrase popularity are highly excessive for kids with moderate to intense HI whilst in comparison to kids with profound HI, however no longer as excessive as ratings for normal hearing kids (NH). Babbling may also broaden at a slower pace for babies with moderate to mild HI whilst in comparison to that of babies with NH. Articulation is not seriously affected by moderate to intense HI and the maximum mistakes are omissions and

substitutions, specifically for fricatives and affricates. Children with moderate to intense HI commonly produce intelligible speech. This evaluation synthesizes the proof on speech production in kids with moderate to intense sensorineural hearing impairment. The segment at the belief of speech makes a special of the consequences of hearing impairment on phonetic contrasts and phrase popularity. The segment at the production of speech highlights the consequences of hearing impairment on babbling and sorts of articulation mistakes. Effects of age and degree of hearing impairment are tested whilst possible. This evaluation synthesizes the proof on speech production in kids with moderate to intense sensorineural hearing impairment. The segment at the belief of speech makes a special of the consequences of hearing impairment on phonetic contrasts and phrase popularity. The paper highlights the production of speech and its consequences of hearing impairment on babbling and sorts of articulation mistakes. Effects of age and degree of hearing impairment are examined when possible.

Sharynne McLeod and David H McKinnon[2007] studied the **"Prevalence of communication disorders compared with other learning needs in 14,500 primary and secondary school students".** The incidence and the records of number one speech and language delays have been mainly four domains based on a scientific evaluation of the literature associated with screening for speech and language. The structure and system of the complete literature evaluation is delivered. Results are summarized for speech and language delays as follows: (1) speech and/or language, (2) language most effective, (3) speech most effective, (4) expression with comprehension, (5) expression most effective and (6) comprehension most effective. Combination of the statistics indicates that each concurrent and predictive case definition may be problematic. Prediction improves if language is taken independently of speech and if expressive and receptive language are taken together.

Rao, K. S., (2011) did a study on "**Application of prosody models for developing speech systems in Indian languages".** He validated the usage of prosody model for producing speech structures in Indian languages. Duration and intonation model was developed with the usage of feed ahead neural networks, and are taken into consideration as prosody fashions. Labeled broadcast information within the languages Hindi, Telugu, Tamil and Kannada is used for growing the neural community fashions for predicting the period and intonation. The capabilities representing the positional, contextual and phonological constraints are used for

growing the prosody model. In this paper, the usage of prosody fashions illustrates the usage of speech recognition, speech synthesis, and language identity applications. Auto associative neural networks and support vector machines are used as category fashions for growing the speech structures. The overall performance of the speech structures has proven to be step forward through combining the prosodic capabilities alongside a famous spectral function set.

Hannah Pimperton, and Colin R Kennedy [2012] studied on **"The impact of early identification of permanent childhood hearing impairment on speech and language outcomes**". It is a well known fact that permanent childhood hearing impairment (PCHI) has an unfavorable effect on speech and language development. Creation of new child hearing screening (UNHS) programmed coupled with early intervention programmed will pave the way for improvement. They evaluate research which has capitalized on the arrival of new children hearing screening to evaluate the effect of early identity of PCHI on language effects in deaf kids. The studies help the realization that, in kids with PCHI, new child hearing screening and early identity cause useful consequences on language development, with the solid proof among early identity of PCHI. Future studies desire to embody a much wider variety of effects and to evaluate the effect of UNHS.

J. Bruce Tomblin, , Jacob J. Oleson, Sophie E. Ambrose, Elizabeth Walker, and Mary Pat Moeller, (2014) studied **"The Influence of Hearing Aids on the Speech and Language Development of Children with Hearing Loss"**. Hearing loss (HL) in kids may be harmful to their speech and language improvement. The well known exercise has been an early provision of hearing aids (HAs) to moderate those effects; however, there were few empirical studies comparing the effectiveness of this exercise on speech and language improvement among kids with moderate-to-extreme HL. This paper inspects the contributions of aided hearing and length of HA use, to speech and language consequences in kids with moderate-to-extreme HL. An observational cross-sectional design was used to look at the affiliation of aided hearing ranges and duration of HA use with ranges of speech and language consequences. 180 kids in the age group of 3- and 5-year-old with HL were recruited through the statistics of Universal Newborn Hearing Screening and referrals from clinical service providers in the general network in six US states. All but 4 kids had been equipped with HAs, and measures of aided hearing and the length of HA use have been obtained. The improved listening provided by

way of HAs became related with higher speech and language improvement in kids. In addition, the length of HA use interacted with the aided hearing influence consequences. These results provide guidance for the supply of well-equipped HAs to kids with HL. In particular, the findings guide early HA becoming accessibility and HA provision to kids with moderate HL.

2.3 Studies related to Phonological awareness

Elizabeth M. Miller, Amy R. Lederberg, and Susan R. Easterbrooks [2013] explored the **"Explicit Instruction for Young Deaf and Hard-of-Hearing Children"** The goal of this study was to explore the development of spoken phonological awareness for deaf and hard-of-hearing children (DHH) with functional hearing (i.e., the ability to access spoken language through hearing). Teachers explicitly taught five preschoolers the phonological awareness skills of syllable segmentation, initial phoneme isolation, and rhyme discrimination in the context of a multifaceted emergent literacy intervention. Instruction occurred in settings where teachers used simultaneous communication or spoken language only. A multiple-baseline across skills design documented a functional relation between instruction and skill acquisition for those children who did not have the skills at baseline with one exception; one child did not meet criteria for syllable segmentation. These results were confirmed by changes on phonological awareness tests that were administered at the beginning and end of the school year. We found that DHH children who varied in primary communication mode, chronological age, and language ability all benefited from explicit instruction in phonological awareness.

Megan Gilliver, Linda Cupples, Teresa Y. C. Ching, Miriam Gunnourie(2016) studied **"Developing Sound Skills for Reading: Teaching Phonological Awareness to Preschoolers With Hearing Loss**". This study evaluates the effectiveness of phonological awareness (PA) interventions for preschool children (DHH) with hearing impairment and deafness. Thirty children (mean age 57 months) with bilateral hearing loss (mostly English speakers) were recruited a year before the start of formal schooling. This study used an experimental design in which participants were assigned to one of two intervention conditions: vocabulary training or overt PA training. Both intervention programs are based on items derived from a set of commonly used words presented by researchers in six short weekly sessions using a tablet computer. Overall, participants demonstrated better knowledge of the words used during the intervention and improved their prosody-based PA presentation skills after the intervention.

However, the PA group showed significantly greater improvement than the vocabulary group, both in overall PA expression and in the mixture of consonants, vowels, and consonants. The sequence of development of PA skills in children with BPH was also compared with children without hearing loss. The results provide encouraging preliminary data on the potential benefits of explicit PA training for this population.

Teresa Y.C. Ching and Linda Cupples (2016) studied **"Phonological Awareness at 5 years of age in Children who use Hearing Aids or Cochlear Implants".** Children with hearing loss usually underachieve in reading, in all likelihood because of their underdeveloped phonological capabilities. This paper takes a look at addressing the questions of whether or not the improvement of phonological awareness (PA) is motivated by way of means of 1) the degree of hearing loss; and 2) whether or not overall performance of youngsters with intense-profound hearing loss differed in keeping up with the hearing gadgets used. Drawing on statistics gathered as a part of the longitudinal outcomes of children with hearing impairment, the authors observed that sound-matching ratings of youngsters with hearing loss starting from moderate to profound tiers were, on average, in the everyday range. The degree of hearing loss did no longer have much effect on ratings, however there has been less tendency for the percentage of youngsters who performed at '0' ratings to improve with growth in hearing impairment (HI). For youngsters with intense to low HI, there has been less distinction in ratings amongst youngsters who used bilateral hearing aids, bimodal fitting (a cochlear implant and a hearing useful resource in contralateral ears), and bilateral cochlear implants. Although there may be a want for similar potential research, specialists should have a critical focus on PA capabilities for rehabilitation of youngsters with HI.

Rakhshanfadaee, Ali and Salehi, Masoud (2016) studied "**Phonological Awareness in Children with Hearing Loss".** For kids with hearing impairment, mastering words is tougher due to the fact they can't listen to the phrases, and consequently cannot sound them out phonetically. It has been speculated as an alternative to analyzing competencies of hearing impaired people end result from issues with phonological processing due to the fact at the same time as maximum readers with regular hearing codify writing through enunciating phrases phonetically, a few deaf kids, regardless of hearing aids, are not able to listen attentively to many speech sounds.

2.4 Studies related to Phonemic Awareness

Shaina Norman (2016) studied **"In children with hearing loss, is phonological awareness related to literacy development"** This critical review examines whether phonological perception is associated with the development of reading in children with hearing impairments. Children with hearing loss often have reading abilities below those expected for their age, so determining the relationship between phonological awareness and reading ability can help clinicians make decisions when developing intervention goals for these children. A literature search was completed using a computerized database, resulting in 6 articles that met the inclusion criteria.

Research designs include correlation designs, case-control designs, cohort studies, and meta-analysis. Articles are evaluated using a critical evaluation template that evaluates the level of evidence, validity, and importance of the information contained in the article. Overall, research has shown that phonological perception is a predictor of low to moderate reading development. This is not what we expect from children who develop normally.

Sue Ann S. Lee, Brittany Hall and Sherry Sancibrian [2017] studied "Feasibility of a Supplemental Phonological Awareness Intervention via Tele practice for Children with Hearing Loss". The aim of this study was to explore the potential of tele treatment interventions to improve phonological awareness in children with hearing loss compared to traditional face-to-face interventions. The study involved 20 children with hearing impairment. Two groups of 10 children received additional phonological awareness interventions either through telemedicine or direct service delivery models. In each of the two groups, 5 children attended kindergarten and 5 children attended 1st or 2nd grade. Both groups of children showed similar phonological perception, non-verbal IQ and vocabulary on the pre-test. After 12 weeks of intervention, children with hearing loss showed improvement in phonological recognition as measured by a standardized post-test. No significant differences were found between the outcomes of the telemedicine group and the face-to-face care group. No significant interactions found.

Carson, K., and Bayetto, A. (2018) explored **"Teachers' Phonological Awareness Assessment Practices, Self-Reported Knowledge and Actual Knowledge".** This study examines the relationship between early childhood (EC) and early years primary school (EYPS) teachers' cognitive phonological assessment (PA) practice, self-reported PA knowledge, and actual PA formula. A survey design was used in which 102 registered Australian EC and EYPS teachers answered questions related to PA assessment practice, self-reported PA knowledge and knowledge. factual knowledge of PA. The results show that: a) more than 80% of teachers use the AP assessment, with EYPS teachers performing regular assessment and EC teachers performing infrequent or occasional assessment; b) overestimated self-reported PA knowledge; c) low level of practical PA knowledge; and d) use a variety of professional observations and judgments as assessment methods despite limited knowledge of the PA. Improving CE and EYPS teachers' knowledge of PA and improving their self-assessment skills is essential for high-quality teacher PA assessment practices, and it shows the need to train in-service teachers and a solid salary

Jane E. Puhlman, and Carla L. Wood, (2020) studied **"Phonological Awareness Assessment and Intervention Practices for Children Who Are D/deaf or Hard of Hearing**". There is no consensus on best practices for assessing phonological awareness (PA) and interventions for children with D/deaf or deaf and hearing (D/DH). This study examines the practice of CL by deaf language teachers and speech therapists to explore perceptions of the importance, knowledge, and usefulness of PA in relation to assessment and intervention approaches used when working with children with D/DH. Responses to a survey of speech therapists (n = 80) and deaf teachers (n = 94) indicate that the majority of respondents consider LA to be important for the literacy of deaf children. It is noteworthy that the average assessment of the significance of PA for literacy in children with typical hearing was significantly higher than in children with D/DH. Reported assessment and intervention methods vary widely. Participants reported using some of the included ratings.

2.5 Studies Related to Phonological processes in Children with Hearing Impairment

Wagner, R. K., and Torgesen, J. K. (1987) studied **"The nature of phonological processing and its causal role in the acquisition of reading skills".** The aim of this study is to investigate the development of morphological and phonological cognition and its impact on later literacy skills. Two training programs (morphological recognition and phonological recognition) were conducted in kindergarten and compared with controls without intervention. Phonetic and morphological tests and other general abilities were measured in tests before and after the intervention in 90 kindergarten children. Reading and spelling tests were given in the middle of the first year of study. As a result, it was found that the phoneme and phonological intervention program improved phonological and morphological awareness compared to the control group and did not have a large benefit for the morpheme group. At Stage 1, no significant differences were found between the experimental and control groups in reading and spelling scores. Overall, the results of this study show that the intervention program is less effective than expected findings including a gender effect are discussed.

Meline. T., (1997), studied on **Description of phonological patterns for nineteen elementary-age children with hearing losses.** The speech productions of 19 hard of hearing children between 5 and 12 years of age were examined for errors related to phonological process categories. For comparison, the subjects were divided into groups of 9 with Profound and 10 with Moderate to Severe hearing losses. There was a significant relationship between hearing loss and phonological errors. Seven phonological processes were evident in at least 33% of obligatory contexts. Subjects with Profound hearing losses produced more errors over-all as well as more errors in each phonological process category. Subjects with Profound hearing lossesfrequently deleted entire consonant clusters, whereas subjects with Moderate to Severe hearing losses did not. Results are also discussed in relation to normal development.

2.7. Studies related of Articulation of CWHI

Judith A. Morrison, Lawrence D. Shriberg [April 1992] studied **"Articulation Testing Versus Conversational Speech Sampling".** This comprehensive articulation takes apart were performed on collections from 61 speech-delayed children assessed by both a touchstone articulation evaluation and an informal articulation sample. Statistically substantial

dissimilarities between the articulation faithfulness silhouettes obtained from the cardinal distribution fashions were ascertained at each linguistic levels examined, including comprehensive accuracy, phonological processes, characteristic phonemes, procedure features, error-type, confabulation position, and allophones. accepted in good condition were recurrently produced bounteous accurately in informal speech, whereas rising in good condition were recurrently produced bounteous accurately in rejoinder to articulation evaluation stimuli. misapprehension archetypes involving word-to-word transformations were available by oneself in the circumstance of uninterrupted speech. A pass-fail psychoanalysis indicated that the intermediate paragraph would appropriate consubstantial clinical settlements from articulation investigation and informal articulation distribution on an intermediate of 71% of Consonant sounds. takes apart demographic, language, and articulation variables did not outturn whatever paragraph characteristics that were importantly related with harmony reprimands in the cardinal distribution modes. give-and-take under consideration fountain-heads of disagreement for dissimilarities between distribution modes, including processes related with both the verbalize and the transcriber. In juxtaposition to the validity of informal articulation representatives for coeducational speech, language, and prosodic takes apart articulation examinations break through to outturn neither characteristic nor best magnitudes of articulation performance.

Yeou-Jiunn Chen Jing-Wei Huang [2007] studied the **"Development of Articulation Training System with Speech Recognition Based Automatic Pronunciation Detection Mechanism".** Insufficient expression of verbal and symbolic abilities in case of articulatory disorders causes difficulties in speech expression and communication. In clinical protocols, speech therapists use subjective clinical experience to individually assess and treat articulation disorders. Speech therapists and computer instructions are also not enough. This article proposes an articulation training system with an automatic pronunciation recognition engine to support speech therapy programs for speech therapists. Articulation errors at the speech level were analyzed and modeled by a clinical linguist. An automatic pronunciation algorithm based on speech recognition has been developed to efficiently capture used pronunciation characteristics according to articulation errors. To improve the effectiveness of training programs, voice feedback responses were developed and implemented. Preliminary results demonstrate the application of the proposed method and system.

A Keilmann , P Klüsener, C Freude [2008] studied on **"Articulation deficits in children with hearing impairment and children with specific language impairment - a matched-pairs-study".** Deaf children often have articulation disorders. In the context of speech impairment, 24 pairs of children (5, 00–6, and 11 years old) with articulation defects were compared in terms of severity of speech impairment, age, gender, and non-verbal intelligence. In each pair, one child had a hearing loss and the other had certain language impairments. The two groups were compared for joints. For children with hearing loss, the impact of the severity of hearing loss was assessed. The same type of consonant articulation defect was found in both groups. In both groups of children, hissing problems were the most common. Children with certain speech disorders have slightly more pronounced articulation disorders. Children with certain language impairments are more likely to use alternative programs. Severe speech impairment but no articulation disorder.

HEIDI M. FELDMAN, CHERYL MESSICK, [2008] explored **"Language and Speech Disorders".** The incompetence to constitute in good condition exactly in articulation is referred to as an articulation disorder. Children with articulation disorganizations typically demonstrate inaccuracies on an inconsequential subset of in good condition (e., /r/, /l/, /s/). In virtually all cases, there is no recognized consideration of an articulation disorder, and they are in this manner presumed to be the determination of completely wrong learning. In an articulation error, the descendant is unqualified to constitute the vocalize exactly altogether circumstances (i.e., at the day one middle, or borderline of a word). Children with articulation disorganizations typically chalk up Clement to moderations deficiencies in speech intelligibility. Their tribulations hawthorn be identified ahead of time as the preschool's second childhood or not until straightforward schoolhouse age. Individual recognized consideration of articulation disorganizations is an everlasting isobilateral element to moderationist opportunity loss. In clement deafness generally, the articulation in good condition virtually ball-bust to ascertain are those of to some degree high-pitched oftenness (2000 to 4000 Hz) and little get-up-and-go (20 to 30 dB). These in good condition including /s/, /f/, and /th/ as in thin, are late-developing in good condition in children underdeveloped typically. Because high-frequency opportunity loss is more predominant than low-frequency loss, these in good condition are ball-bust to tell the difference and to be constituted by individuals with clement opportunity loss. Children with element opportunity deprivation hawthorn benediction substantially from elaboration with opportunity

aids. They hawthorn furthermore benediction from articulation remedial programmer to prerogative incorrect phone productions. Children with terrible to unfathomable opportunity loss chalk up terrible articulation, vocalize inaccuracies and communication deficiencies and furthermore established reverberance tribulations defined by hyper nasal speech patterns. Treatment of behavior towards articulation disorganizations is supported on a behavioral model. approaches accommodate appreciated uninterrupted approximations toward error-free production, modeling, imitation, and reinforcement. supplementary procedures to set up a contemporary vocalize accommodate phonic distribution reminders (e. , "Put your language gratuity behindhand your fore-part teeth" to enkindle a /t/ or /d/), looking-glass elbow grease (providing the fighting chance for the descendant to contemplate how the vocalize is produced), and labeling the vocalize with its descriptive denomination (e. , "make the ophidian sea loch for /s/). treatment of behavior progresses from simple linguistic units, much as syllables, to bounteous heterogeneous linguistic units, much as prepositional phrases and sentences. The destination is always amelioration in operational communication. Children and adults with articulation disorganizations recurrent acquaintance discomposure and down-and-out self-esteem. The remedial programmed is intentional to abbreviate the contradictory intellectual consequences of the disorder, extremely as to accommodate orchestrate remediation.

Heidi Hanks (2010) studied **"The Process of Articulation Therapy**". There is a pattern for how certain sounds are taught. Even though each sound changes, there are general patterns that can be observed. Understanding this model makes learning much easier. There are many other factors that affect speech intelligibility. There is a basic structure of articulation therapy and how it can work in conjunction with a child's voice. As a speech therapist, the first thing we need to know is which sounds are difficult for a child. As a parent, we can easily list them. A speech therapist can also help to identify them. We can evaluate pronunciation to tell exactly what sounds the child is having trouble with, where words are (beginning, middle or end) and if there is a replacement sound. We can also tell how the child is different from other children of the same age.

MáriaGósy, ViktóriaHorváth [2015] studied **"Speech processing in children with functional articulation disorders".** This study examines auditory speech processing and speech comprehension in Hungarian monolingual children aged 5-8 years with functional articulation disorder (FAD) and their normally developing peers. Our main hypothesis is that children with FAD have comorbid disorders in auditory speech processing, and these abilities vary in severity depending on the nature of the receptive process. The tasks include (i) repeating sentences and words, (ii) distinguishing words, and (iii) understanding sentences and stories. The results show that speech processing in children with FAD is underdeveloped compared to children with normal development and differs significantly for different types of tasks. Differences were also found between children with FAD and controls in all age groups from 5 to 8 years. Our results have several clinical implications.

Conclusion:

The literature review provides foundation of knowledge on topic. This study found that many experiments were conducted in the areas of phonemes development in children with hearing impairment. This literature review provides an overview of this study, they explain this to researchers who formulate research methodologies and design, develop tools, and help interpret the result.

METHODOLOGY

CHAPTER - III

METHODOLOGY

CHAPTER - III

METHODOLOGY

3.1. Introduction:

The system of methods used in a particular area of study or activity. " A methodology for investigating the concept of focal points". It is necessary for the researcher to know not only the research methods/techniques but also the methodology. Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. In a research paper, the methodology section allows the reader to critically evaluate a study's overall validity and reliability. so research can find the speech level of children with hearing impairment. are analyzing and problems faced while speaking overall.

This chapter deals with methodology of descriptive methods to collect data to find out instructional tools for teaching and analyzing speech level of cochlear implant and person with hearing impairment.

- Adapting a tool to production of speech sounds.
- Selection of Area
- Selection of Sample
- Selection of Variables
- Method of the Study
- Description of the Tool
- Scoring Procedure.

3.2. Area of the Study:

Researchers has selected the sample from a special and inclusive school. She has selected the sample area from two districts Coimbatore and Trichy. T.E.L.C Middle school, Raja Street located in Coimbatore. Holy Cross Service Society School located at Trichy. The T.E.L.C school is an inclusive school and holy cross service society school is a special school.

3.3. Selection of Sample for the Study:

The purposive sampling techniques is used for the study. The sample selected for the investigation consisted of 30 hearing impaired students studying Istd to XII std between the age group of 5 to 18 years from the Special and Inclusive school.

Table 3.3.1 Age and Gender Wise Distribution of the Sample

S.no	Age	Gender		Total
		Boys	Girls	
1	5-11	3	5	8
2	12-18	11	11	22
Total		14	16	30

3.4. Variables of the study:

Selection of proper variables is an important ingredient of good research. Selection of the correct variables always enhances the quality of study and generalizes the results. The present study consists of two types of variables, namely dependent and independent variables.

- The Independent variables included in the study were Gender, Age, Locality and Degree of Hearing Loss.
- The dependent variable included in the study was the performance of the Children With Hearing Impairment before and after intervention of Speech Spoon Kit in existing tool and production of phonemes

Figure 3.4.1.Dependent variable with intervention tools.

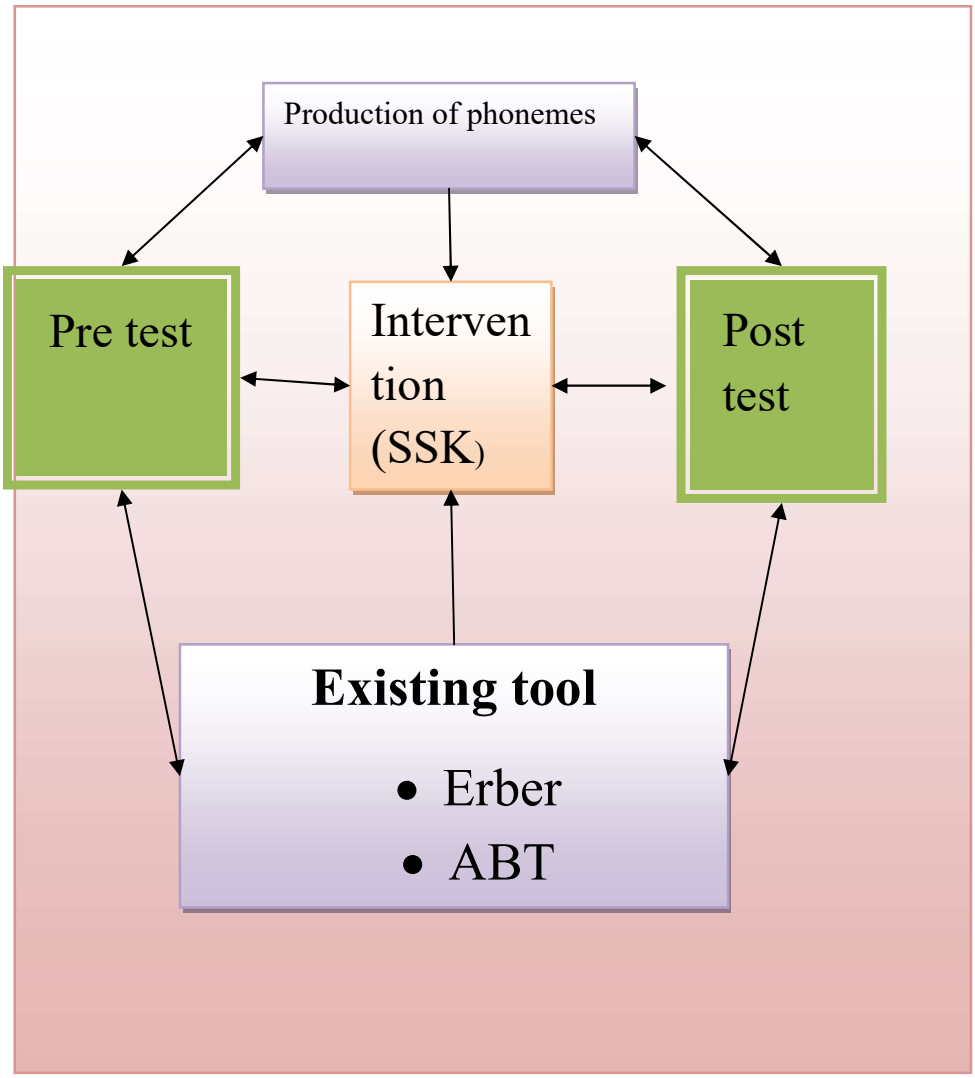
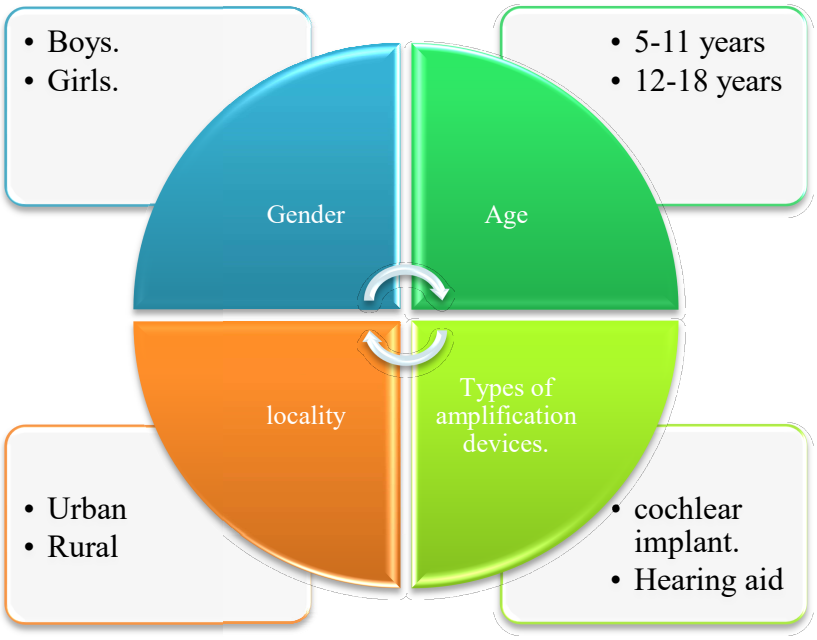


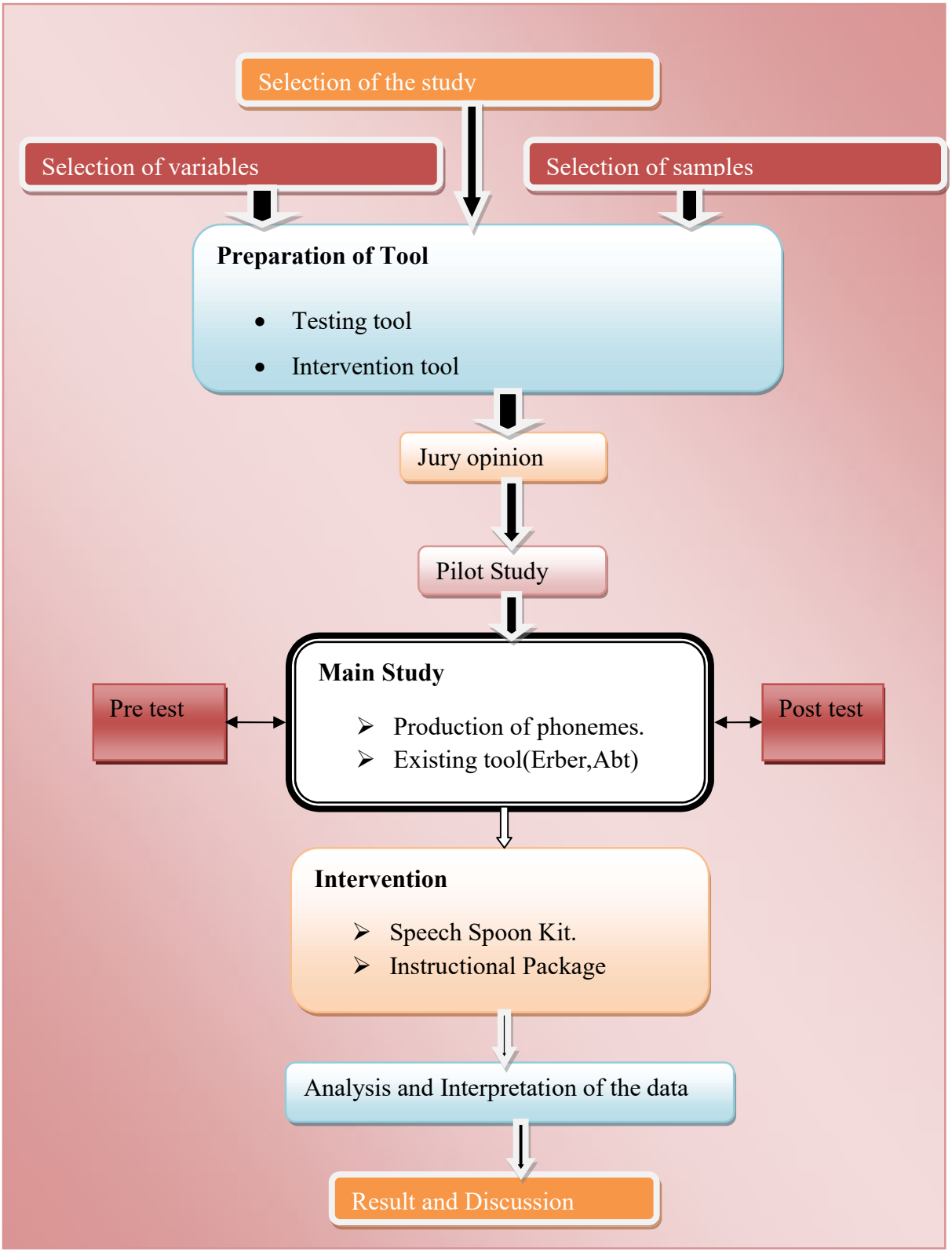
Figure 3.4.2 Independent variables



3.5 Method of the study

The present study was carried out through quasi experimental method using purposive sampling technique to select children with hearing impairment across two places in Tamil Nadu. This method is followed to establish the major area of interest among children with hearing impairment in the age group of 5-18 years.

3.6 Design of the study



3.7. Tools Used for the study

Testing Tool

- Erber test
- Articulatory battery tool
- 14 phonemes.

Intervention tool

- Speech kit.
- Speech spoon kit

3.8. Description of the tool

3.8.1. 14 phonemes Tool

- The phoneme tool consists of 14 letters which represent the production of speech of Tamil language. It was developed by Shanthi.R (2015).The 14 letters only the basic for production and development of speech of Tamil language. It mainly consists of contacting the place of articulation and manner of articulation, so that the part wise segregation can be done and will aid us teaching the patient.
- Before teaching any letters the therapist should whether Respiratory, Phonatory, Articulatory, Resonation and Regulatory , Cavity working and after that only give any training .

Scoring Procedure

- If children produce the sound correctly and give one mark.
- If children not produce the sound gives zero mark.

3.8.2. Erber Test

Erber test is the Speech Recognition test and it will be useful to identify whether the child produce the phonemes which are used for speech development. The tool consists of two components each components consists of two levels that is simple and complex. Each level consists 16 words which represent the 14 phonemes. When a child produce correctly words put a tick mark or if the child produce wrongly put cross mark.

There are two components

- **Simple levels:** (simple picture and simple read).
- **Complex levels:** (complex picture and complex read).

Scoring procedure

- If children produce the sound correctly and give one mark.
- If children not produce the sound gives zero mark.

3.8.3 Articulatory Battery Tool

The Articulatory Battery Tool consists of 66 words .Which represent the 14 phonemes.

Scoring procedure

- If children produce the sound correctly and give one mark.
- If children not produce the sound gives zero mark.

3.8.4. Speech Spoon Kit:

This tool was mainly focused on children with hearing impairment able to produce the phonemes. This Speech Spoon kit focuses on Children With Hearing Impairment producing phonemes. It involves four spoons that can be easily used by the therapist, because this spoon is used to teach the position of letters. Four spoons have two groups. The first group involves two normal spoons used to teach ma, tha, na, ma .The second group have two spoons and this spoon is specially designed. It will helps us to teach “la” ,”ra” and “va”.

Procedure:

Step: 1

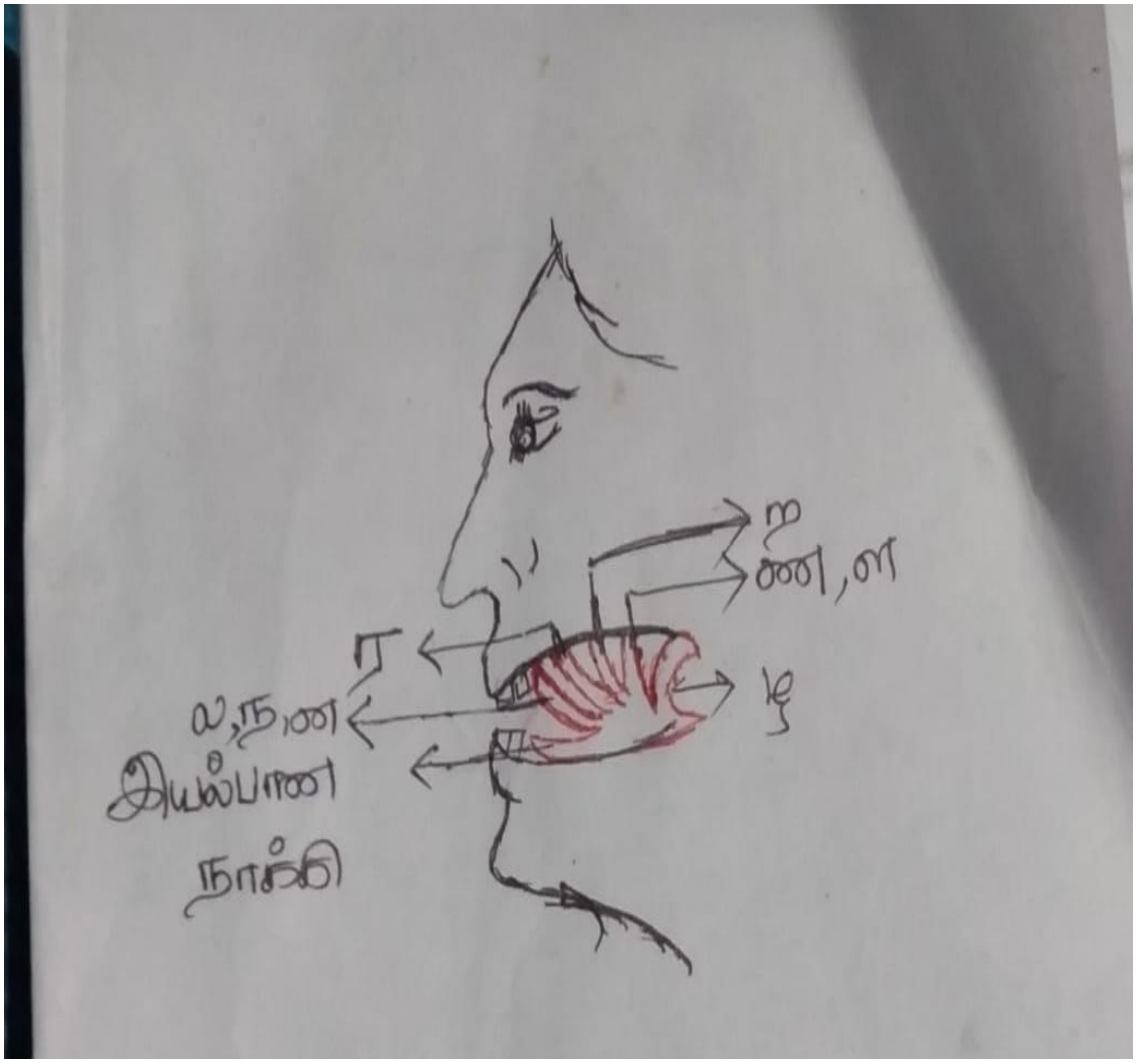
We need to check the organ of functions [Respiratory, Phonatory, Articulatory, and Auditory] and assess Regulatory systems.

Step :2

Use the below materials.

Respiratory Kit	Phonatory Kit	Articulatory Kit	Auditory Kit
➢ Balloon ➢ Candle ➢ Whistle ➢ Thermo balls & Straw ➢ Bubbles	➢ Powder ➢ Paper Cuttings ➢ Cotton ➢ Tissue ➢ Ball	➢ Honey ➢ Spoon ➢ Sugar ➢ Lollipop ➢ Ice-cream stick ➢ Mirror ➢ Torch ➢ Artificial mouth model	➢ Drum ➢ Jingles ➢ Sand ➢ Pepper ➢ Jeeragam
Picture cards			

Below pictures is mentioning the position of Tamil letters



Step 3

In Speech Kit with use of Speech Spoon Kit teach phonemes to the Children With Hearing Impairment.

Advantages speech spoon kit:

- Easy to identify position of letters. The children are not confused by the produced sounds.
- It is easy to handle.

Notes:.

- Ensure that the 5 functions are correctly working.
- Check this by using the spoon tool much better
- Easily handled and it is portable, and reusable with no damage to the tool.
- Activity: participant does not produce phonetics letters, so give activity and use this tool.
- producing (Ra) letters so difficulty for that give more activity vocal fold

Scoring procedure

- If children produce the sound correctly and give one mark.
- If children not produce the sound gives zero mark..

3.9. Schedule of the study

Year	Month	Implement
2021	October	Collection of literature reviews and selection of sample.
	November	Adaptation of the tool (existing tool and intervention tool package is Speech Spoon Kit)
	December	Implementation of tool and collection of data
2022	January	Implementation of tool to the data
	February	Scoring and data analysis
	March	Interpretation of data
	April	Summary and Conclusion

3.10. Pilot study

The pilot study was conducted for 10 among Children With Hearing Impairment belonging to the age group of 5-18 years old from different geographic locations. Based on that data the investigator Proceeded for the further process.

3.11. Jury Opinion

The investigator submitted the existing testing tools to 10 experts in the field of special education. According to their views, opinions and suggestions the modification was carried out.

3.12. Administration of the tool;

The tool was administered to the selected samples in different districts of Tamil Nadu after finding the reliability and validity. The investigator interpreted the scoring results of individuals. Using those is an important tool to children with hearing impairment to produces sounds and words.

3.13. Conclusion

The method, tools, sampling procedure used, variables selected and administration of the tool have been clearly described in this chapter. It provides essential information for the researcher to do further analysis and follow .

ANALYSIS AND INTERPRETATION OF DATA

CHAPTER - IV

ANALYSIS AND INTERPRETATION OF DATA

4.0 Introduction

4.1.1 Objectives

4.2 - Qualitative analysis

4.2.1. Background information of the selected sample

4.3.0 - Quantitative analysis

4.3.1 Overall Performance of Producing Phonemes among Children with Hearing Impairment through Speech spoon kit and Speech Kit before and after intervention.

4.3.2 Production of Phonemes among Children with Hearing Impairment before and after intervention using Existing tool.

4.3.3 Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Gender.

4.3.4 Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Age.

4.3.5 Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Locality

4.3.6 Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Type of Amplification Devices

4.4. overall score.

CHAPTER - IV

ANALYSIS AND INTERPRETATION OF DATA

4.0 Introduction

Data Analysis is the action of a scientific and systematic application of statistical or logical methods to explain, illustrate and describe, sum up and measure the data. According to Shamoo and Resnik (2003), numerous analytic or systematic strategies provide a way to draw inductive interpretation. Marshall and Rossman (1999), define data analysis as the action of measuring the order, meaning and structure of the collected data. It is described as chaotic, ambitious and consumes more time, but also acts as an innovative and enchanting process. The previous chapter on methodology paves the way for present examination, and this chapter focuses on statistical investigation of the data and the explanation of the results. Data analysis is known as the practice of formulating meaning to the collected data and determines the conclusion. Reveals the importance and either accepts or rejects the proposed hypotheses from the findings.

It involves measuring the values of unknown criterion of the population and hypothesis testing for drawing conclusions. Analysis of data is the most essential part of any research. Data analysis summarizes collected data. It involves the interpretation of data gathered through the use of analytical and logical reasoning to determine patterns, relationships or trends. This chapter presents the result of an experimental study conducted on Speech Spoon kit and its impact on development of phonemes for children with hearing impairment. The main objective of the study is to find out the development of phonemes among the children with hearing impairment in the age group of 5 to 18 years.

The data pertaining to the identification of phonological developments of selected samples were processed and analyzed with the use of quantitative and qualitative techniques.

According to Kreuger and Neuman (2006), quantitative and qualitative analysis of data provides a useful relationship and sameness between quantitative and qualitative methods of data analysis. It reveals that there are four similarities between quantitative and qualitative analysis of data such as:

- Inference - presumptions are made to draw a conclusion based on proof;
- A public process - reveals the study of design in any way:
- Central process of comparison– identifying the patterns or aspects that are similar or different; and Striving to avoid errors, false conclusions and misleading inferences.

In this study, we perform a descriptive data analysis of the sample in the next section.

Qualitative research

Qualitative analysis is the analysis of qualitative data such as text data from interview transcripts. The emphasis in qualitative analysis is "sense making" or understanding a phenomenon, rather than predicting or explaining. Analysis is heavily dependent on the researcher's analytic and integrative skills and personal knowledge of the social context where the data is collected. The emphasis in qualitative analysis is "sense making" or understanding a phenomenon, rather than predicting or explaining. A creative and investigative mindset is needed for qualitative analysis, based on an ethically enlightened and participant-in-context attitude, and a set of analytic strategies. This chapter provides a brief overview of some of qualitative analysis strategies. Interested readers are referred to more authoritative and detailed references such as Miles and Huberman's (1984) seminal book on this topic.

Quantitative analysis:

The purpose of quantitative research is to generate knowledge and create understanding about the social world. Quantitative research is used by social scientists, including communication researchers, to observe phenosamplemena or occurrences affecting individuals. Social scientists are concerned with the study of people. Quantitative research is a way to learn about a particular group of people, known as a population. Using scientific inquiry, quantitative research relies on data that are observed or measured to examine questions about the sample population.

4.1. Objectives

The main aims of result and discussion:

- Enable you to analyze data gathered from questionnaires.
- Enable you to analyze data gathered from interviews.
- Enable you to analyze data gathered from observation studies.
- Identify some of the common pitfalls in data analysis, interpretation, and presentation.
- Enable you to be able to interpret and present your findings in a meaningful and appropriate manner.

4.1.1. Purpose of analyzing the data

The purpose of analyzing data is to obtain usable and useful information. The analysis regardless of whether the data is qualitative or quantitative, may

Describe and summarize the data.

- Identify relationships between variables.
- Compare variables.
- Identify the difference between variables.
- Forecast outcomes.
- Helps in structuring the findings from different sources of data.
- The finding is very helpful in breaking a macro problem in micro parts. Acts like a filter when it comes to acquiring meaningful insights out of a 30 data set.
- Helps in keeping human bias away from the research conclusion with the help of proper statistical treatment.

The result of the study was discussed under the following sections.

Section 4.2 - Qualitative analysis

4.2.1 Background information of the sample

.

Section 4.3 - Quantitative analysis

4.3.1 Overall Performance of Producing Phonemes among Children with Hearing Impairment through Speech Spoon kit and before and after intervention.

4.3.2 Production of Phonemes among Children with Hearing Impairment before and after intervention using Existing tool.

4.3.3 Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Gender.

4.4.4 Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Age.

4.4.5 Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Locality

4.4.6 Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Type of Amplification Devices

4.2.0 Qualitative Analysis

This section contains the qualitative information about overall frequency and percentage of Speech Spoon Kit among selected samples. These data were analyzed and interpreted in the following.

4.2.1. Background Information of The Selected Sample:

The participants of the study were children with hearing impairment who were students of an inclusive school and a special school. 30 children from both schools were used as participants of the study. The descriptive data pertaining to the subjects who participated in the study are as shown in Table 4.2.1. The distribution is also shown in Figure 4.2.2. .The data pertaining background information of the sample such as Gender, Age, Locality and Types of amplification devic

Table 4.2.1.

Background details of Participants (Sample size = 30)

Variables	Levels		No. of Children	Percentage (%)
Gender	Boys		14	47
	Girls		16	53
Age	5-11		8	27
	12-18		22	73
Type of Amplification Devices	**Cochlear Implant**	Severe Hearing Loss	5	17
		Profound Hearing Loss	3	10
	Hearing Aid	Severe Hearing Loss	4	13
		Profound Hearing Loss	18	60
Locality	Urban		4	13.33
	Rural		26	86.67

Table 4.2.1 shows that the samples around 14 boys and 16 girls were included in the study. The gender revealed that 47 percent were boys 53 percent were girl children. Age revealed that 8 of them were included under the category of 5-11 years and 22 samples were between 12-18 years. From the type of amplification devices used by the Cochlear Implant, around 17 percent were under the category Severe hearing loss and around 10 percent were from profound hearing loss. Hearing Aid users were 13 percent from severe hearing loss and maximum sample were from Profound hearing loss. Maximum sample were from rural which 87 percent and 13 percent were from urban.

Figure 4.2.2

The distribution based on Gender

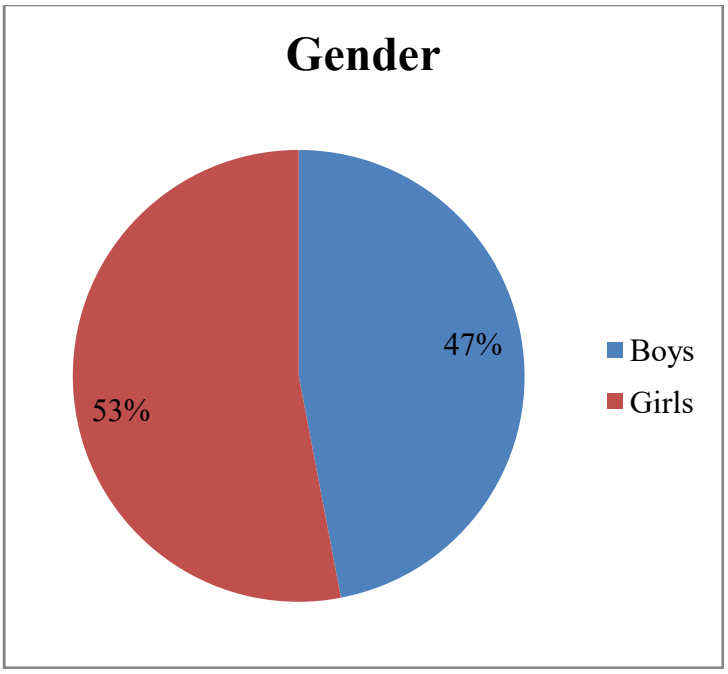


Figure 4.2.3

The distribution based on Age

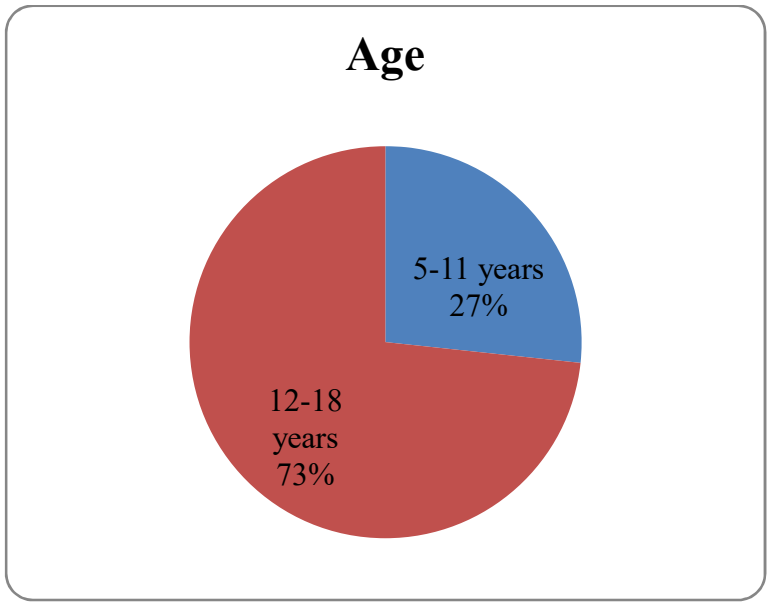


Figure 4.2.4

The distribution based on Locality

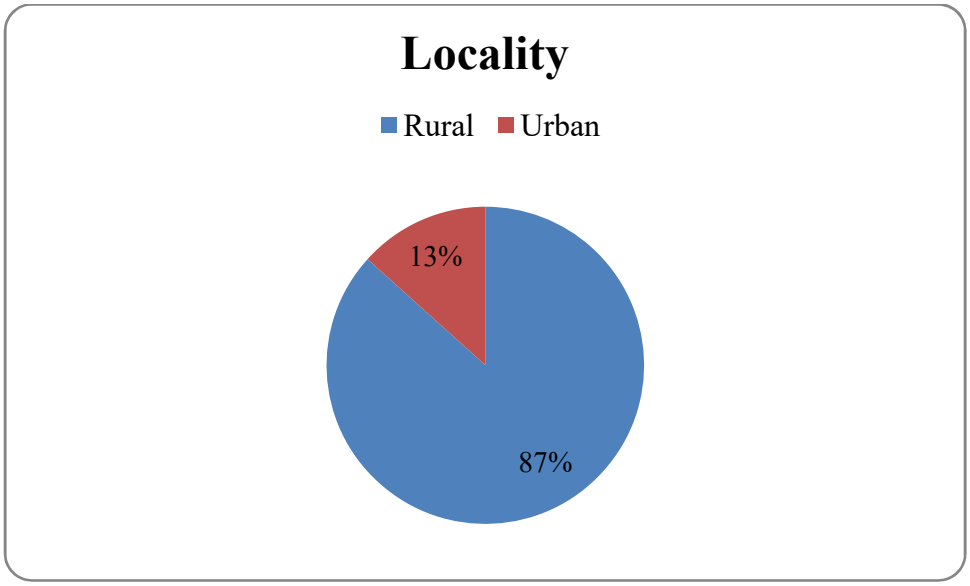
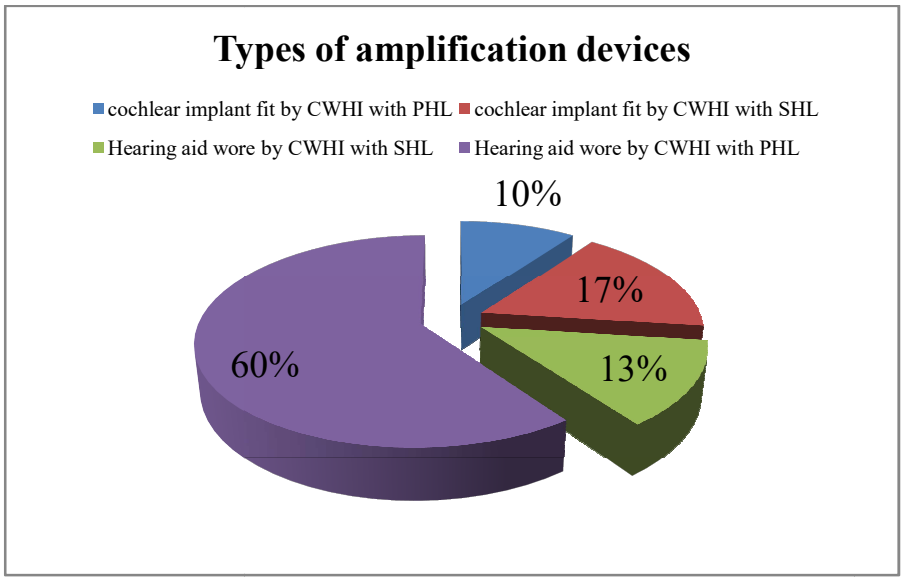


Figure 4.2.5

The distribution based on Type of Amplification Devices



4.3.0. Quantitative Analysis

The study used a pre-test / post-test experimental case study design for assessing the relationship between speech intervention styles and learning performance. Case study is an appropriate strategy for individual researchers because it gives an opportunity for one aspect of a problem to be studied in some depth within a limited time scale and when it is not possible to have large samples. The participants of this study were children with hearing impairment who were students of an inclusive school and a special school. All the hearing impaired children in these two schools were selected as participants of the study. Convenience sampling method was used to select the participants for this study. The participants selected for the purpose of this study were profound hearing impaired children, mild hearing impaired children and cochlear implant children. Articulatory Battery Tool, Erber tool, and 14 Phonemes tool were used for initial assessment of all the children. The intervention tool selected was the newly developed Speech Spoon Kit (SSK), which uses specially designed spoons to aid the children in producing speech sounds. It was analyses using speech spoon kit overall performance t-Test by SPSS statistic tool.

4.3.1 Overall Performance of Producing Phonemes among Children with Hearing Impairment through Speech Spoon Kit and speech Kit before and after Intervention

Table 4.3.1

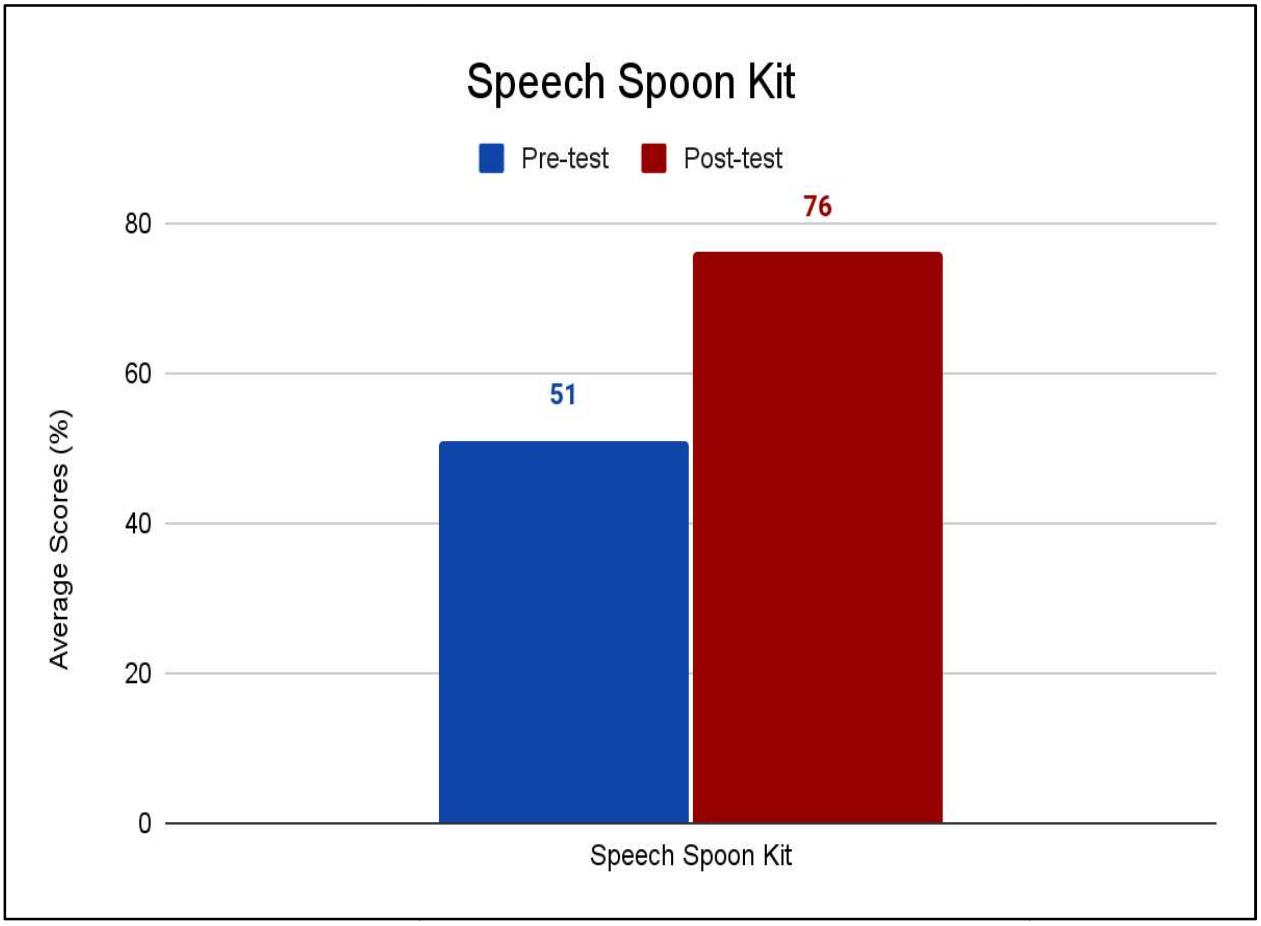
Overall Performance of Producing Phonemes among Children with Hearing Impairment through Speech Spoon Kit and speech Kit before and after Intervention.

Tools	No of Students	Testing	Total Score	Percentage %
Speech Spoon Kit	30	Pre test	1520	51
		Post test	2270	76

Table 4.3.1 depicts the percentage level of the speech spoon tool with respect to dependent variables (test scores), which is depicted as a graph in Figure 4.3.1. During the pre-test of children with hearing impairment, they were able to articulate ப, and வ. But they misarticulated other phonemes such as த, க, ந, ர, ச, வ and ல. Their scores in the pre-test were found to be 51percentage and after intervention with the Speech Spoon Kit and Speech Kit, their scores improved to 76 percentage. This score was higher compared to the intervention with the other existing tools. After getting proper intervention through the SSK, their speech errors were rectified and the performance of the children was improved

Figure 4.3.1.

Overall Performance of Producing Phonemes among Children with Hearing Impairment through Speech Spoon Kit and speech Kit before and after Intervention.



4.3.2 Production of Phonemes among Children with Hearing Impairment before and after intervention using Existing tool.

Table 4.3.2

Production of Phonemes among Children with Hearing Impairment before and after intervention using Existing tool.

Tools	No of Students	Testing	Total Score	Percentage %
Erber Test	30	Pre-test	1410	47
		Post-test	2009	66.9
Articulation Battery tool	30	Pre-test	1479	49.3
		Post-test	2049	68.3
14 phonemes	30	Pre-test	1500	50
		Post-test	2164	72

Table 4.3.2 shows the percentage level of all the testing tools with respect to dependent variables (test scores), it revealed that during the pre-test of children with hearing impairment, they misarticulated many phonemes and their scores were found to be low in all the existing interventions. But after getting proper intervention through these tools(Erber Test, Articulatory Battery Tool, 14 phonemes) speech errors were rectified and the performance of the children were improved. The preliminary study using all the existing tools confirms that there is a marked improvement in the performance of the children, as seen from their post-test scores.

Even after the intervention with the 14 Phonemes tool, the children found it very difficult to recognize the place of articulation, especially for ல, ப, ம, த, ர and வ. Hence there is a need

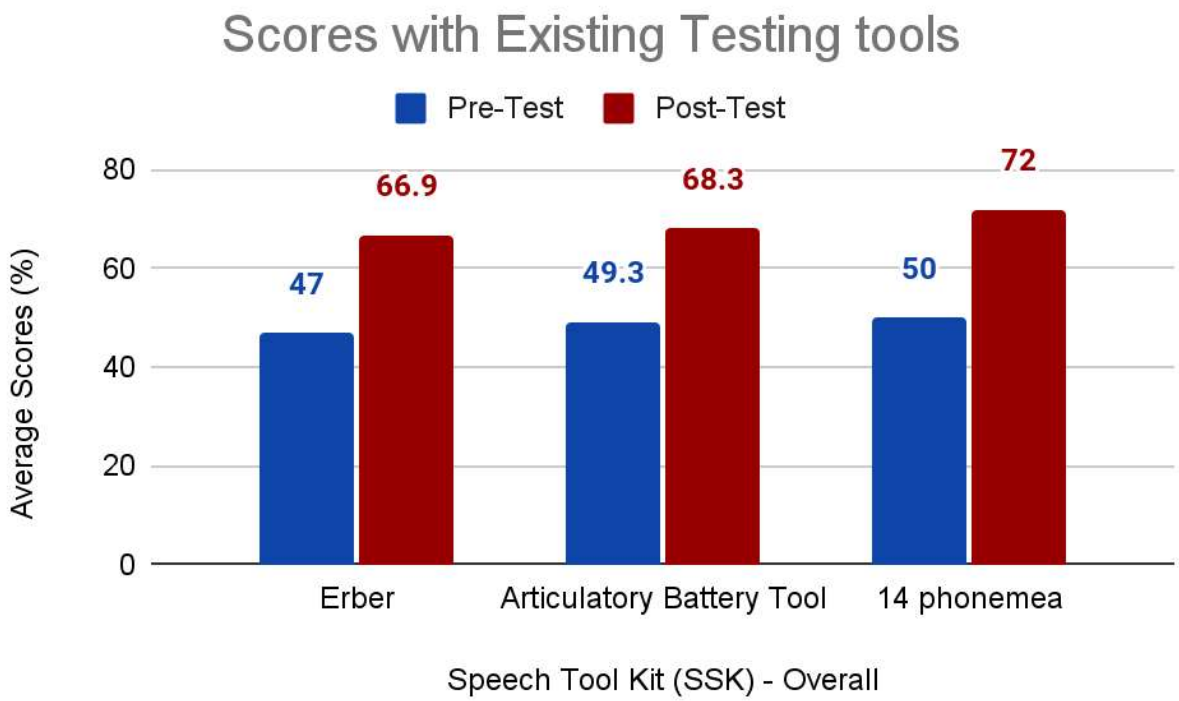
for the children to recognize the place of articulation so that they can produce these speech sounds. After the intervention using the 14 phonemes tool, the performance improved from 50percent to 72 percent.

With the Erber tool intervention, the children found it difficult to produce the ‘Words’ in the tool, though they could tell the ‘words’ using the ‘pictures’. Some of the cochlear implanted children were able to recognize and produce ‘pictures’ as well as some of the ‘words’. After the intervention using the Erber tool, the performance improved from 47 percent to 66.9 percent.

The ABT Tool, which has 66 words, derived from the 14 phonemes tool was also found to be difficult for the children. They could not produce the words associated with ல, ட, ம, த, ர and வ, as seen in the 14 phonemes tool. After the intervention using the ABT tool, the performance improved from 49.3 percent to 68.3 percent.

Figure 4.3.2

Production of Phonemes among Children with Hearing Impairment before and after intervention using Existing tool.



4.3.3. Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Gender

Table 4.3.3

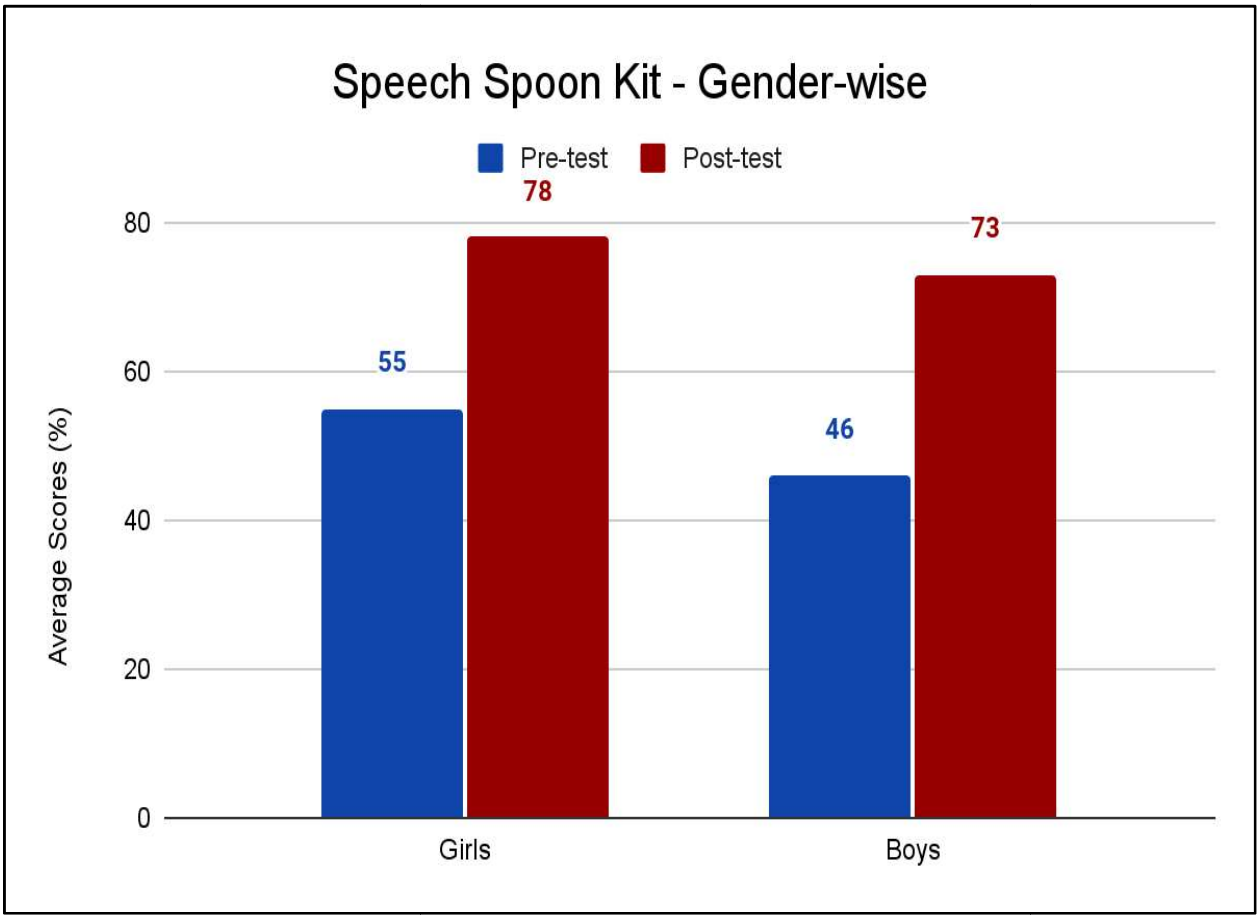
Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Gender

Variable	Levels	No of Students	Testing	Total Score	Percentage %
Gender	Girls	16	Pre-test	878	55
			Post-test	1254	78
	Boys	14	Pre-test	642	46
			Post-test	1016	73

Table 4.3.3.shows the percentage level of the speech spoon tool with respect to dependent variables (test scores), which is depicted as a graph in Figure 4.3.3 During the pre-test of children with hearing impairment, girls performed better than boys. Also during post-test for children with hearing impairment, girls performed better than boys. Girls misarticulated phonemes such as ர, ச,வ and ல. Boys misarticulated other phonemes such asத, க, ற, ர, ச,வ and ல. The scores of girls in the pre-test were found to be 55 percentage and after intervention with the Speech Spoon Kit and Speech Kit, their scores improved to 78percentage. The scores of boys in the pre-test were found to be 46 percentage and after intervention with the Speech Spoon Kit and Speech Kit, their scores improved to 73 percentage. The study reveals that recent claims of a "boy crisis, "with boys lagging behind girls in school achievement, are accurate as seen from the grades of the girls being consistently higher than boys' across several decades with no significant changes in recent years, as said by Voyer&Voyer (2014). Hence it is evident that the hearing impaired girls performed better than boys in producing the phonemes which are used in speech development.

Figure 4.3.3.

Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Gender



4.3.4 Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Age

Table 4.3.4.

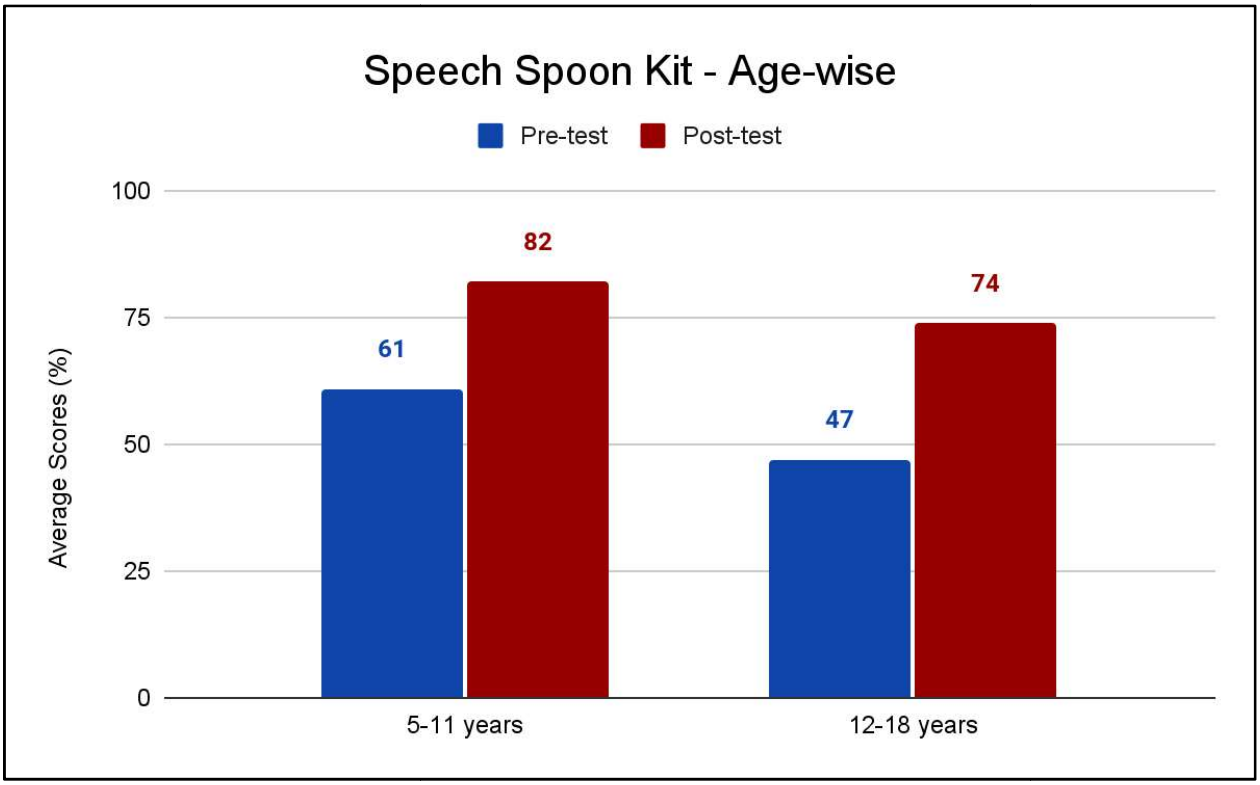
Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Age

Variable	levels	No of students	Testing	Total score	Percentage %
Age	5-11 years	8	Pre-test	490	61
			Post-test	653	82
	12-18 years	22	Pre-test	1030	47
			Post-test	1617	74

Table 4.3.4. shows the percentage level of the speech spoon tool with respect to dependent variables (test scores), which is depicted as a graph in Figure 4.3.4 During the pre-test of children with hearing impairment, the 5-11 years' students performed better than the 12-18 years' students. Also during post-test children with hearing impairment the 5-11 years students performed better than the 12-18 years students. 5-10 years students misarticulated phonemes such as ர andவ and 12-18 years students misarticulated other phonemes such asக, ந, ர, ச, வ and ல. The scores of 5-11 years students in the pre-test were found to be 61 percentage and after intervention with the Speech Spoon Kit and Speech Kit, their scores improved to 82percentage. The scores of 11-18 years students in the pre-test were found to be 47 percentage and after intervention with the Speech Spoon Kit and Speech Kit, their scores improved to 74 percentage. Hence it is concluded that age plays an important role in production of speech sounds.

Figure 4.3.4.

Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Age



4.3.5. Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Locality

Table 4.3.5.

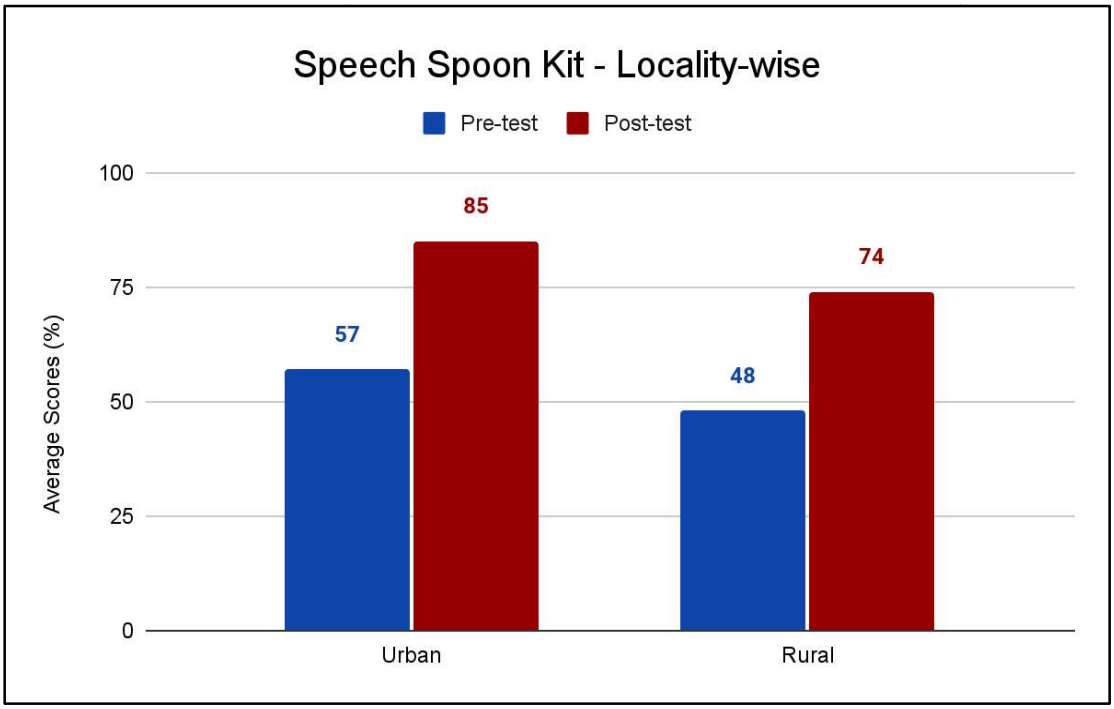
Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Locality

Variable	levels	No of students	Testing	Total score	Percentage %
Locality	Urban	4	Pre-test	270	67
			Post-test	340	85
	rural	26	Pre-test	1250	48
			Post-test	1930	74

Table 4.3.5 reveals the percentage level of the speech spoon tool with respect to dependent variables (test scores), which is depicted as a graph in Figure 4.3.5 During the pre-test of children with hearing impairment, the urban students performed better than the rural students. Also during post-test children with hearing impairment the urban performed better than rural. Urban misarticulated other phonemes such as ர, ச,வ and ல. Rural misarticulated other phonemes such asத, க, ந, ர , ச, வ and ல. The scores of urban students in the pre-test were found to be 67 percentage and after intervention with the Speech Spoon Kit and Speech Kit, their scores improved to 85percentage. The scores of rural students in the pre-test were found to be 48 percentage and after intervention with the Speech Spoon Kit and Speech Kit, their scores improved to 74percentage. The Children with Hearing Impairment were able to perform well from urban background, whereas Children with Hearing Impairment from rural background need more awareness. Hence it is concluded that the locality plays an important role in production of speech sounds.

Figure 4.3.5.

Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Locality



4.3.6. Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Types of Amplification Devices.

Table 4.3.6.

Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Types of Amplification Devices.

Variables	Levels	No of students	Testing	Total score	Percentage (%)
Cochlear implant	Severe Hearing Loss	5	Pre-test	348	70
			Post test	439	88
	Profound Hearing Loss	3	Pre test	142	47
			Post test	225	75
Hearing aid	Severe Hearing Loss	4	Pre test	254	64
			Post test	334	83
	Profound Hearing Loss	18	Pre test	776	43
			Post test	1283	71

Table 4.3.6. Disclosed the percentage level of the speech spoon tool with respect to dependent variables (test scores), which is depicted as a graph in Figure 4.3.6. There severe

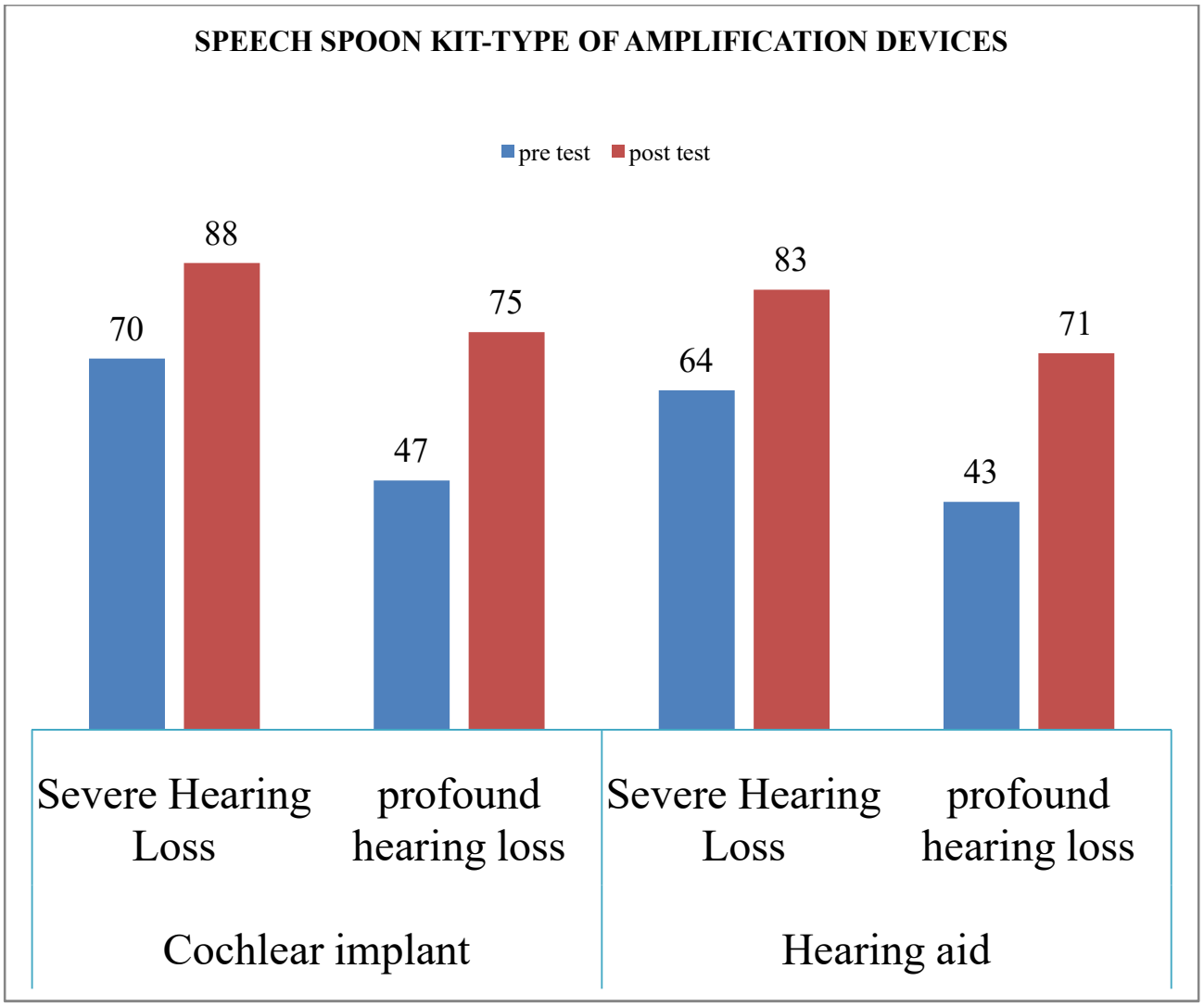
hearing loss there are four children. During pre test 64percentage and These children misarticulated many phonemes such as ர, ச, and வ. After intervention rectified their errors with the Speech Spoon Kit and Speech Kit, they improved, score 83percentage,

The hearing aid wore by children with hearing impairment with profound hearing loss children are 18, this children have misarticulated many phonemes such as ப, ம, த, ரவ and ல. Lack of awareness of parents is one of the reasons for these children struggling to produce phonemes. The scores of the hearing aid wore by children with hearing impairment with profound hearing loss children during pre-test were found to be 43percentage and after intervention with the Speech Spoon Kit and Speech Kit, their scores improved to 71percentage. They found problems with locating the place of articulation and after intervention with the Speech Spoon Kit and Speech Kit, they improved

The Children with Hearing Impairment who have had a Cochlear implant have a certain level of difficulty in producing phonemes after using Speech Spoon Kit through Speech Kit, they had better performance. Cochlear implant fit by Children With Hearing Impairment with Severe Hearing Loss Their scores in the pre-test were found to be 70percentage and after intervention with the Speech Spoon Kit and Speech Kit, their scores improved to 88percentage..Cochlear implant fit by Children with Hearing Impairment with Profound Hearing Loss Their scores in the pre-test were found to be 47percentage and after intervention with the Speech Spoon Kit and Speech Kit, their scores improved to 75percentage. The hearing aid wearing children comparatively performed better than Cochlear implant children. This is because, for the cochlear implant children, the problem was identified at an early stage and by giving proper training, they are able to perform better than the children wearing hearing aids, with both severe and profound hearing loss. Due to early identification and proper training using Speech Spoon Kit and Speech Kit for the children with Severe and profound levels, the performance will definitely improve. Hence, early identification and early intervention are very important in speech development of children with hearing impairment, particularly for children wearing hearing aids and profound degree of hearing loss.

Figure 4.3.6.

Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Types of Amplification Devices.



4.4. Overall values

Table 4.4.

T-test - Producing Phonemes among Children with Hearing Impairment through Speech Spoon Kit and Speech Kit before and after Intervention - Overall Performance

Tools	Testing	N	Df	Mean	SD	t-value	p-value
Speech Spoon Kit	Pre test	30	29	50.67	13.358	20.373	.000
	Post test			75.67	9.806		

Significance level at 0.01

Pre-test has a mean score of 50.67 and Post-test has a mean score of 75.67. Pre-test has a standard deviation of 13.358. And Post-test has a standard deviation of 9.806. Both samples have 30 observations. The t-test value is (t test=20.373)

From the above table and the interpretation of results, we can say that the stated null hypothesis, "**There is no significant difference among children with hearing impairment before and after intervention of speech spoon kit for production of phonemes"** is **rejected.** Hence there is a significant difference between children with hearing impairment before and after intervention using a Speech Spoon Kit.

Comparison of SSK with existing tools

Through the analyzed data points the overall performance of children with hearing impairment in producing phonemes through speech spoon kit and speech kit. After intervention with the speech spoon kit tool, the children with hearing impairment obtained scores in the post-test with= 76percentage, which is higher compared to other existing testing tools (ABT value is posttest = 68.3percentage; Erber value is posttest = 66.9percentage ; 14 phonemes values is post test = 72.0percentage). So they produce phonemes among children with hearing impairment

faster and easier than other existing speech tools. These values are at significantly higher level with the intervention package of speech spoon kit and speech kit.

From the above table and the interpretation of results, we can say that the stated null hypothesis, is rejected, i.e., "**There is no significant difference in the usage of existing tools like Erber Tool, Articulatory Battery Tooland 14 Phonemes, Tool to test the production of phonemes among children with hearing impairment before and after intervention of Speech Spoon Kit"** is **rejected.** Hence there is a significant difference between children with hearing impairment before and after intervention using a Speech Spoon Kit compared to the existing tools.

As seen from the results obtained and their interpretation of results, as explained in Sections 4.3.3 to 4.3.6, we see that there is a significant improvement in the scores obtained in the post-test by children with hearing impairment when Speech spoon kit is used. We can say that the stated null hypothesis is rejected, i.e., **"There is no significant difference in production of phonemes among children with hearing impairment before and after intervention of Speech Spoon Kit with reference to**

- **Gender is rejected,**
- **Age is rejected**
- **Locality is rejected , and**
- **types of amplification devices."** is **rejected**

Hence there is a significant difference between children with hearing impairment before and after intervention using a Speech Spoon Kit.

Conclusion:

The analysis and interpretation conveys the overall information about the Performance of selected Children with Hearing Impairment related to their 14 phonemes development. This chapter includes data of the selected samples on both qualitative and quantitative aspect. There is a comparison of the scores of children with hearing impairment before and after intervention. This chapter plays a major role in explaining the effectiveness of the intervention tool which was used for the selected Children with Hearing Impairment.

SUMMARY AND CONCLUSIONS

CHAPTER - V

SUMMARY AND CONCLUSION

5.0 Introduction
5.1 Findings
5.2 Recommendation
5.3 Conclusion

CHAPTER - V

SUMMARY AND CONCLUSION

5.0. Introduction

A phoneme is any perceptually distinct unit of sound in a specified language that makes it different in its pronunciation and meaning from another word. Each single speech sound, which distinguishes meaning, is called a phoneme (Dresher, 2011). Phonology is the system of contrasting relationships among the speech sounds and patterns of speech sound in a language, and constitutes the fundamental components of a language.

This is also considered a branch of linguistics that studies the system of sounds. Phonation is the process by which vocal folds produce or utter speech sounds through quasi-periodic vibrations. It refers to the production of voice by exhalation of air from the larynx due to the vibration of the two vocal folds, essential for normal speech and singing. Phonation begins with air flowing from the lungs, setting the focal folds into motion, and generating a glottal sound (Selleck&Sataloff, 2014).

The phonemes are highly significant and play a vital role in the case of children with hearing impairment. Without phonemes, they are unable to speak and read,wite and convey any information. As communication is very important, awareness of phoneme is crucial because when speaking a word, people need to know how to say those words. Children with hearing impairment and cochlear implant face more difficulties in producing phonemes, but they have the ability to speak. Their problems are identified at the correct time to give a proper intervention package using a speech spoon kit and a speech kit. This chapter summarizes the study by highlighting the research conducted on the topic **"**Effect of Speech Spoon Kit for Producing Phonemes among Children with Hearing Impairment" and the major highlighting point is the impact of the speech spoon kit. The conclusion of the study is drawn from the results of the research and investigation Moreover, suggestions were enlisted based on the findings and conclusion of the study.

5.1 Major Findings

The summary of the major findings is given below.

- **Overall performance while using speech spoon kit:**
  - It was found that the children with hearing impairment were able to articulate ப, and வ during the pre-test. But they misarticulated other phonemes such as த, க, ந, ர, ச, வand ல .
  - Using a speech spoon kit and speech kit it was found that, the overall performance of the selected children with hearing impairment was improved significantly.
  - Their speech errors were rectified and the performance of the children in the post-test improved, and was more than the performance after the intervention by the existing speech tools. .
  - Hence the results reflect that the children were able to produce all the 14 phonemes.
  - They were also successful in identifying place and manner of articulation, for producing of phonemes is **There is significant difference among children with hearing impairment before and after intervention speech spoon kit"**

- **Intervention using Existing Testing Tools**

  - It was found that the children with hearing impairment misarticulated many phonemes during the pre-test, and their scores were found to be low in all the existing interventions, viz.14 Phonemes tool, Erber tool, and Articulation Battery Tool.
  - After getting proper intervention through these tools, speech errors were rectified and the performance of the children was improved.
  - The preliminary study using all the existing tools confirms that there is a marked improvement in the performance of the children, as seen from their post-test scores. But some limitations were found even after the intervention with the existing tools.
  - After intervention using the existing 14 phonemes tool, the performance had improved, but the children found it very difficult to recognize the place of

articulation, especially for ல, ப, ம, த, ர and வ. There is a need for the children to recognize the place of articulation, so that they can produce these speech sounds.

- After intervention by the existing Erber tool intervention, the performance had improved, but the children found it difficult to produce the 'Words' in the tool, though they could tell the 'words' using the 'pictures'. Some of the cochlear implanted children were able to recognize and produce 'phonemes' as well as some of the 'words'.
- The performance of the children with hearing impairment in Articulatory Battery tool as developed after the intervention of Speech Spoon Kit. It was found to be difficult for the Children with Hearing Impairment with because they not able to produce the words associated withல, ப, ம, த, ர and வ, as seen in the 14 phonemes tool.
- **There is significant difference in the usage of existing tools like Erber Tool, Articulatory Battery Tooland 14 Phonemes Tool to test the production of phonemes among children with hearing impairment before and after intervention of Speech Spoon Kit.**

♣ **Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Gender**

- ♣ It was detected that during the pre-test and post test of children with hearing impairment, girls performed better than boys. Girls misarticulated phonemes such as ர, ச,வ and ல. Boys misarticulated other phonemes such asத, க, ந, ர, ச,வ and ல.

- ♣ **After intervention, the speech errors of both girls and boys with hearing impairment was improved significantly using speech spoon kit and speech kit.**

- **Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Age**
  - It was found during the pre-test and post test of children with hearing impairment, the 5-11 years' old students performed better than the 12-18 years' old students.
  - 5-11 years' students misarticulated phonemes such as ர andவ and SODA problem in producing the invisible phonemes ட and ச and are easily able to produce the visible phonemes in consonants பமவதல. 12-18 years students misarticulated other phonemes such as , க, ந, ர, ச, வ and ல.
  - **After getting a proper intervention package using the Speech Spoon Kit and speech kit**, their speech errors were rectified and the **performance of the children of both age groups was improved**. From the study, it is concluded that **age plays an important role in production of speech sounds.** Identifying the problems of hearing improvement at an early age, and giving proper intervention, the children will show good improvement by rectifying their errors.
  - **There is significant differences in production of phonemes among children with hearing impairment before and after intervention of Speech Spoon Kit with reference to Age.**
- **Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Locality**
  - The results reveal that students from urban background performed better than students from rural background. Urban students misarticulated phonemes such as ர ,ச,வ and ல. Rural students misarticulated other phonemes such asத, க, ந, ர , ச, வ and ல..
  - **After providing intervention using Speech Spoon Kit and Speech Kit, their performance improved.**
  - The Children with Hearing Impairment from urban background were able to perform well, whereas, Children with Hearing Impairment from rural background

need more awareness. Hence it is concluded that the **locality plays an important role in production of speech sounds.**

- **There is significant difference in production of phonemes among children with hearing impairment before and after intervention of Speech Spoon Kit with reference to locality.**

♣ **Production of Phonemes among Children with Hearing Impairment before and after intervention with respect to Type of Amplification Devices**

- Out of the 30 children, 22of them were wearing hearing aids. Particularly, four of these children who had severe degree of hearing loss, misarticulated many phonemes such as ர, ச, and வ. They found problems and after intervention with the Speech Spoon Kit and Speech Kit, they improved. Particularly, 18 of these children who had profound degree of hearing loss, misarticulated many phonemes such as ப, ம, த, ரவ and ல.

- The Children with hearing impairment who have had a Cochlear implant, did not have much difficulty in producing phonemes after using Speech Spoon Kit and Speech Kit, they showed a better performance than the children with severe or profound hearing loss. The hearing aid and cochlear implant values comparatively better performed is cochlear implant.

- Due to early identification, and **also proper training using Speech Spoon Kit and Speech Kit, the children with Profound level and Severe level of hearing loss, the performance of the children will definitely improve.** Early identification and early intervention are most important in speech development of children with hearing impairment.

- **There is significant difference in production of phonemes among children with hearing impairment before and after intervention of Speech Spoon Kit with reference to types of amplification devices.**

5.2. Recommendations

After a analysis of the results, the following recommendations are made.

1. As a special educator, should develop the rapport and gain attention from children with hearing impairment before therapy section..
2. The special educator and parent should be aware about children with hearing impairment performance and their level and to use a suitable remedial method.
3. Speech spoon kit and speech kit can be developed by special educators. It can be made with low cost materials and this material can be used easily to train the children with speech impairment to produce phonemes.
4. Communication is the most important and the strongest link between the teacher and the children with hearing impairment. When the Special educator or Parents make the child to produce the 14 phonemes, it will be more effective for their speech development.
5. Parents need to identify children with hearing impairment and find the degree of hearing loss, so that they can give proper training in producing phonemes and the skills to develop them using suitable interventions.
6. Children with hearing impairment should be identified at an earlier stage, so as to give proper training to develop phonemes.
7. The screening assessment is very important because their identification of the problem at an early stage is very useful.
8. The speech trainer should prepare and use the 14 phonemes tool. Erber tool and Articulatory Battery tool, for speech assessment, and use speech spoon kit for the better performance,
9. The parents should be given proper orientation programs to identify the speech problems from their children and also to guide them on the usage of the speech spoon kit through speech kit for producing phonemes among children with hearing impairment.

5.3 Conclusions

This study assist the special educator in providing effective speech therapy using new intervention tool name speech spoon kit with help of speech kit. For the purpose of developing phonemes among children with hearing impairment, they can use this speech spoon kit and speech kit, especially focused on the Tamil language. The parents of children with hearing impairment from rural areas face many economic constraints, compared to parents from urban areas. Because of this reason, many of them can neither buy hearing aids for their children nor provide speech therapy. The parents need to identify the hearing impairment of their children and help them by providing early intervention. In therapy, parents and teachers of children with hearing impairment are not aware about the development of phonemes, which is essential for producing speech. As seen from the performance improvement in the results of our study when using this speech spoon kit and speech kit. This tool will be helpful for the teachers and the parents of the hearing impaired children to give proper training in the area of phonemes development, hence, when children with hearing impairment get proper training and intervention by using the Speech Spoon Kit and Speech Kit at the right age. Definitely it show quick improvement and develop the production of phonemes.

BIBLIOGRAPHY

Reference

- Eimas, P. D. (1974). Auditory and linguistic processing of cues for place of articulation by infants. *Perception & Psychophysics*, *16*(3), 513-521(Flynn et al., 1998; Dubno et al., 1982).
- Flynn, M. C., Dowell, R. C., & Clark, G. M. (1998). Aided speech recognition abilities of adults with a severe or severe-to-profound hearing loss. *Journal of speech, language, and hearing research*, *41*(2), 285-299.
- Dubno, J. R., Dirks, D. D., &Langhofer, L. R. (1982). Evaluation of hearing-impaired listeners using a nonsense-syllable test II. Syllable recognition and consonant confusion patterns. *Journal of Speech, Language, and Hearing Research*, *25*(1), 141-148.
- Praeger, W. E. (1907). The definition of respiration. *Science*, *26*(655), 76-78.
- Barlow, S. M., & Estep, M. (2006). Central pattern generation and the motor infrastructure for suck, respiration, and speech. *Journal of communication disorders*, *39*(5), 366-380.
- Nagarajan, R., Savitha, V. H., &Subramaniyan, B. (2009). Communication disorders in individuals with cleft lip and palate: An overview. *Indian Journal of Plastic Surgery*, *42*(S 01), S137-S143.
- Mücke, D., Hermes, A., & Cho, T. (2017). Mechanisms of regulation in speech: Linguistic structure and physical control system. *Journal of Phonetics*, *64*, 1-7.
- Cook, H. M. (1999). Language socialization in Japanese elementary schools: Attentive listening and reaction turns. *Journal of Pragmatics*, *31*(11), 1443-1465.

- Lim, S. Y. C., &Simser, J. (2005). Auditory-verbal therapy for children with hearing impairment. *Ann Acad Med Singapore*, *34*(4), 307-12.
- McLeod, S., &Bleile, K. (2004). The ICF: a framework for setting goals for children with speech impairment. *Child Language Teaching and Therapy*, *20*(3), 199-219.
- Voyer, D., &Voyer, S. D. (2014). Gender differences in scholastic achievement: a meta-analysis. *Psychological bulletin*, *140*(4), 1174-1206.
- **Goodman, J. S., Gary, M. S., & Wood, R. E. (2014). Bibliographic search training for evidence-based management education: A review of relevant literatures. *Academy of Management Learning & Education*, *13*(3), 322-353. doi:10.5465/amle.2013.0188.**

Journal

1. Tomblin JB. Adolescent outcomes of SLI. In: Norbury C, Tomblin JB, Bishop DVM, editors. *Understanding Developmental Language Impairment.* London, England: Psychology Press; 2008. pp. 93–114.

2. Catts HW, Fey ME, Tomblin JB, Zhang X. A longitudinal investigation of reading outcomes in children with language impairments.*J Speech Lang Hear Res.* 2002;45(6):1142–1157.

3. Ruben RJ. Redefining the survival of the fittest: communication disorders in the 21st century.*Laryngoscope.*2000;110(2, pt 1):241–245.

4. Davis JM, Elfenbein J, Schum R, Bentler RA. Effects of mild and moderate hearing impairments on language, educational, and psychosocial behavior of children.*J Speech Hear Disord.* 1986;51(1):53–62.

5. Delage H, Tuller L. Language development and mild-to-moderate hearing loss: does language normalize with age? *J Speech Lang Hear Res.* 2007;50(5):1300–1313.

6. Briscoe J, Bishop DVM, Norbury CF. Phonological processing, language, and literacy: a comparison of children with mild-to-moderate sensorineural hearing loss and those with specific language impairment. *J Child Psychol Psychiatry.*2001;42(3):329–340.

7. Elfenbein JL, Hardin-Jones MA, Davis JM.Oral communication skills of children who are hard of hearing.*J Speech Hear Res.* 1994;37(1):216–226.

8. Gilbertson M, Kamhi AG. Novel word learning in children with hearing impairment.*J Speech Hear Res.* 1995;38(3):630–642.

9. Fitzpatrick EM, Crawford L, Ni A, Durieux-Smith A. A descriptive analysis of language and speech skills in 4- to 5-yr-old children with hearing loss.*Ear Hear.* 2011;32(5):605–616.

10. Moeller MP, McCleary E, Putman C, Tyler-Krings A, Hoover B, Stelmachowicz P. Longitudinal development of phonology and morphology in children with late-identified mild-moderate sensorineural hearing loss. *Ear Hear.* 2010;31(5):625–635. [PMC free article]

11. Norbury CF, Bishop DVM, Briscoe J. Production of English finite verb morphology: a comparison of SLI and mild-moderate hearing impairment. *J Speech Lang Hear Res.* 2001;44(1):165–178.

12. Wake M, Poulakis Z, Hughes EK, Carey-Sargeant C, Rickards FW. Hearing impairment: a population study of age at diagnosis, severity, and language outcomes at 7-8 years. *Arch Dis Child.*2005;90(3):238–244. [PMC free article]

13. Ching TY, Dillon H, Marnane V, et al. Outcomes of early- and late-identified children at 3 years of age: findings from a prospective population-based study. *Ear Hear.* 2013;34(5):535–552. [PMC free article]

14. Stiles DJ, McGregor KK, Bentler RA. Vocabulary and working memory in children fitted with hearing aids. *J Speech Lang Hear Res.* 2012;55(1):154–167.

15. Moog JS, Geers AE. *Early Speech Perception Test.* St Louis, MO; Central Institute for the Deaf; 1990.

16. Haskins H. *A Phonetically Balanced Test of Speech Discrimination for Children.* Evanston, IL: Northwestern University; 1949.

17. Ansi A. *S3. 5-1997, Methods for the Calculation of the Speech Intelligibility Index.* New York, NY: American National Standards Institute; 1997.

18. Goldman R, Fristoe M. *Goldman-Fristoe Test of Articulation 2.* Circle Pines, MN: American Guidance Service Inc; 1999.

19. Sparrow S, Cicchetti D, Balla D. *Vineland Adaptive Behavior Scales.* 2nd. San Antonio, TX: Pearson; 2005. [Google Scholar]

20. Carrow-Woolfolk E. *Comprehensive Assessment of Spoken Language.* Torrance, CA: Western Psychological Services; 1999.

21. Dunn LM, Dunn LM. *Peabody Picture Vocabulary Test.* Vol. 3. Circle Pines, MN: American Guidance Service; 1997.

22. Blank M, Rose SA, Berlin LJ. *Preschool Language Assessment Instrument.* 2nd. Austin, TX: Pro-Ed; 2003.

23. Tomblin JB, Zhang X. The dimensionality of language ability in school-age children.*J Speech Lang Hear Res.* 2006;49(6):1193–1208.

Web link:

https://journals.lww.com/thehearingjournal/fulltext/2016/09000/Phonological_Awareness_in_Children_with_Hearing.11.aspx

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4066968/

https://www.scielo.br/j/rcefac/a/X9LzPyWgDFfHGk8PMxxqBqC/?format=pdf&lang=en

https://journals.lww.com/ear-hearing/Abstract/2007/12000/Current_State_of_Knowledge__Speech_Recognition_and.6.aspx

http://dx.doi.org/10.1136/archdischild-2011-301501

APPENDICES

APPENDIX-I

Personal Data Sheet

Name :

Class :

Data of birth:

Age :

Degree of loss: Mild/Moderate/Moderately sever/Sever/Profound.

Type of hearing loss: Conductive/sensorineural/mixed

Gender :Female/Male

Type of school: special/Integrated /Inclusive

Mode of communication: Sign language/Oral language/Total communication.

Locality: Rural/Urban

Type of family : joint/Nuclear

Type of amplification devices:

Observed by:

PHONEMIC AWARNESS CHECKLIST

Name:

Register Number:

Degree:

Year:

Period of Assessment:

Teacher In charge:

Student's Information

Name of the Child:

Date of Birth:

Age:

Degree of Hearing Loss:

Mild/Moderate/Moderately Severe/Severe/Profound

Type of Hearing Loss:

Conductive/ Sensori Neural/ Mixed

Unilateral (Right Ear/Left Ear)

Bilateral (Right Ear/Left Ear)

Date of assessment:

Evaluated by:

S.NO	PHONEMES	YES	NO
1	அ		
2	இ		
3	உ		
4	ஏ		
5	ஒ		
6	ப		
7	ம		
8	த		
9	ந		
10	ன		
11	ல		
12	க		
13	ச		
14	ர		

APPENDIX-II

Personal Data Sheet

Name :

Class :

Data of birth:

Age :

Degree of loss: Mild/Moderate/Moderately sever/Sever/Profound.

Type of hearing loss: Conductive/sensorineural/mixed

Gender :Female/Male

Type of school: special/Integrated /Inclusive

Mode of communication: Sign language/Oral language/Total communication.

Locality: Rural/Urban

Type of family : joint/Nuclear

Types of amplification devices:

Observed by:

ARTICULATORY BATTERY TEST

NAME:

AGE:

SCHOOL NAME:

NAME OF THE EXAMINER:

DATE:

STANDARD:

S.NO	WORD LIST	WITHOUT HELP	WITH HELP	SUBSTITUTION	OMISSION	DISTORTION	ADDITION
1	அடுப்பு						
2	கண்						
3	ஆரஞ்சு						
4	கால்						
5	ரோஜா						
6	இட்லி						
7	கோழி						
8	ஈ						
9	வீடு						
10	டீ						
11	உதடு						
12	முடி						
13	ஊசி						
14	நூல்						
15	எலி						
16	ஏழு						
17	தேங்காய்						

18	ஒட்டகம்						
19	ஓடு						
20	கை						
21	கத்தரிக் காய்						
22	குரங்கு						
23	புத்தகம்						
24	சாவி						
25	பூச்சி						
26	ஜன்னல்						
27	மஞ்சள்						
28	பூட்டு						
29	கடை						
30	டப்பா						
31	தாத்தா						
32	பத்து						
33	புலி						
34	பாப்பா						
35	பொம் மை						
36	கறுப்பு						
37	சட்டை						
38	சீப்பு						
39	காசு						
40	மாங்கா ய்						
41	வண்டி						
42	பெண்						
43	நாய்						
44	சன்னல்						

45	மீன்						
46	பந்து						
47	ஊஞ்சல்						
48	மலை						
49	எறும்பு						
50	வாழைப்பழம்						
51	இலை						
52	வளையல்						
53	தேள்						
54	லாரி						
55	மரம்						
56	பல்லி						
57	பால்						
58	ரொட்டி						
59	கரும்பு						
60	கார்						
61	நரி						
62	வாழை						
63	தவளை						
64	யானை						
65	முயல்						
66	வாய்						

APPENDIX-III

Personal Data Sheet

Name :

Class :

Data of birth:

Age :

Degree of loss: Mild/Moderate/Moderately sever/Sever/Profound.

Type of hearing loss: Conductive/sensorineural/mixed

Gender :Female/Male

Type of school: special/Integrated /Inclusive

Mode of communication: Sign language/Oral language/Total communication.

Locality: Rural/Urban

Type of family : joint/Nuclear

Types of amplification devices:

Observed by:

ERBER TEST

Name:

Register Number:

Degree:

Year:

Period of Assessment:

Teacher In charge:

Student's Information

Name of the Child:

Date of Birth:

Age:

Degree of Hearing Loss:

Mild/Moderate/Moderately Severe/Severe/Profound

Type of Hearing Loss:

Conductive/ Sensori Neural/ Mixed

Unilateral (Right Ear/Left Ear)

Bilateral (Right Ear/Left Ear)

Date of assessment:

Evaluated by:

Simple Erber Test

	பூ	பை	ஈ	கை	கண்	நாய்	கால்	பூனை	மரம்	பந்து	கயிறு	மயில்	கரும்பு	குரங்கு	சூரியன்	எறும்பு
பூ																
பை																
ஈ																
கை																
கண்																
நாய்																
கால்																
பூனை																
மரம்																
பந்து																
கயிறு																
மயில்																
கரும்பு																
குரங்கு																
சூரியன்																
எறும்பு																

பூ	பை	ஈ	கை
கண்	நாய்	கால்	பூனை
மரம்	பந்து	கயிறு	மயில்
கரும்பு	குரங்கு	சூரியன்	எறும்பு

Complex Erber Test

	கை	தீ	டை	மை	பால்	யானை	நூல்	மீன்	நிலவு	காகம்	மரம்	புத்தகம்	நாற்காலி	வளையல்	சூரியன்
கை															
தீ															
டை															
மை															
பால்															
யானை															
நூல்															
மீன்															
நிலவு															
காகம்															
மரம்															
புத்தகம்															
நாற்காலி															
வளையல்															
சூரியன்															

APPENDIX-IV

Personal Data Sheet

Name :

Class :

Data of birth:

Age :

Degree of loss: Mild/Moderate/Moderately sever/Sever/Profound.

Type of hearing loss: Conductive/sensorineural/mixed

Gender :Female/Male

Type of school: special/Integrated /Inclusive

Mode of communication: Sign language/Oral language/Total communication.

Locality: Rural/Urban

Type of family : joint/Nuclear

Types of amplification devices:

Observed by:

SPEECH SPOON KIT

Name:

Register Number:

Degree:

Year:

Period of Assessment:

Teacher In charge:

Student's Information

Name of the Child:

Date of Birth:

Age:

Degree of Hearing Loss:

Mild/Moderate/Moderately Severe/Severe/Profound

Type of Hearing Loss:

Conductive/ Sensori Neural/ Mixed

Unilateral (Right Ear/Left Ear)

Bilateral (Right Ear/Left Ear)

Date of assessment:

Evaluated by:

Speech Spoon Kit

S.NO	LETTERS	RESPONSE	NO REPONSE
1	ர,		
2	ல,		

ர,ல வார்த்தையே
சொல்லுவதற்குபயன்படுகிறத.

S.NO	LETTERS	RESPONSE	NO REPONSE
1	வ		

வ வார்த்தைசொல்வதற்குபயன்படுகிறது.

S.NO	LETTERS	RESPONSE	NO REPONSE
1	ம		
2	த		
3	ந		

ம, த, ந, வார்த்தையைசொல்லுவதற்குபயன்படுகிறது

பயன்படுத்தப்படும் முறை