Development and Evaluation of Curriculum for Speech-Language Transcription

(ARF – 3.46)

Principal Investigator

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Manual – 1

Basics of Speech, Language, its Components and Measures

Pooja Khatri

Foreword

All India Institute of Speech and Hearing (AIISH) is a leading institute serving individuals with communication disorders in south Asia, established on 1965.The institute appreciates research in the field of Speech language sciences, speech language pathology and Audiology using the fund called AIISH Research Fund(ARF), raised from the beneficiary population of the institution.

Several research projects is being proposed in order to avail the fund for research purpose, one of them has resulted in development of this practical work book. Lack of manpower to transcribe existing speech language samples created a need to develop a kit to train eligible transcribers. Transcription of spoken language samples would serve as a huge data base of many speech language disorders that helps in clinical as well as research activity. Dr.K.S.Prema, Prof. of Language Pathology, Dept. of Speech-Language Sciences, AIISH, Mysore, initiated the idea to increase manpower generation in speech language transcription, by proposing a project through which curriculum was developed to train volunteers to transcribe speech language transcription. The name of the project is ñDevelopment and Evaluation of Curriculum for Speech Language Transcriptionò, numbered 3.46. The principal investigator has taken all possible inputs from an expertise phonetician, Prof.Peri Baskara Rao, Tokyo University of Foreign studies, wherever necessary.

Basics of speech, language components and its measures is written by Ms. Pooja Khatri, Speech-Language Pathologist, Jaipur Sunrise Greens, Indirapuram, who is well versed in Speech-Language Pathology.

The book contains three chapters.

Chapter I includes information regarding the speech language development in normal and theories related to them

Chapter II speaks about components of speech and measures of normal speech.

Chapter III aims at giving the reader information regarding components of language and its measures.

Prof.K.S.Prema

Dept of Speech Language Ppathology
Principal Investigator of the project

Contents

Chapter III

International Phonetic Alphabet

Chapter IV

Language and Its Components

BASICS OF SPEECH, LANGUAGE COMPONENTS AND ITS MEASURES

Chapter 1

Introduction

The ongoing exchange of message in one form or the other connects all living creatures in a never ending circle. Although language is used by birds and animals, it is only in humans that we find language being used as a most remarkable means of sharing information. We utilize many modalities and speech is the most common and important way in which we use language to communicate. Those of us who seek to understand and help individuals who have communication disorders should first understand as thoroughly as possible the nature of communication, language, and speech and how they are related.

Communication

Communication is a range of purposeful behavior which is used with intent within the structure of social exchanges, to transmit information, observations, or internal states, to bring about changes in the immediate environment. Verbal as well as nonverbal behaviors are included, as long as some intent, evidenced by anticipation of outcome can be inferred. Therefore not all vocalization, or even speech, can qualify as intentional communicative behavior.

Speech and language

Speech and language are tools that humans use to communicate or share thoughts, ideas, and emotions. Humans express thoughts, feelings, and ideas orally to one another through a series of complex movements that alter and mold the basic tone created by voice into specific, decodable sounds. Speech is produced by precisely coordinated muscle actions in the head, neck, chest, and abdomen. Speech development is a gradual process that requires years of practice. During this process, a child learns how to regulate these muscles to produce understandable speech.

Language is the set of rules, shared by the individuals who are communicating, that allows them to exchange those thoughts, ideas, or emotions. Speech is talking, one way to express using language with sounds and combinations of sounds that are meaningful. While there are many languages in the world, each includes its own set of rules for phonology (phonemes or speech sounds or, in the case of signed language, handshapes), morphology (word formation), syntax (sentence formation), semantics (word and sentence meaning), prosody (intonation and rhythm of speech), and pragmatics (effective use of language). In the case of humans, the basic unit of communication involves the speaker and the listener which can be one or many. The flow of message is reflexive, when a listener has processed the information, he generally lets the speaker know what the impact it has had that is in the form of feedback/response given by the listener. The act of talking is extremely a complex behavior and has its own salient features. While all living creatures communicate, only humans exchange information using a code called language. The human species have developed the elaborate system of shared symbols and procedures for combining them into meaningful units. It is a system which implies some regularity in the supply of symbols, that these symbols are shared or hold common meaning for a group of people and that there are procedures or rules concerning how to array or join the symbols into the meaning. Speech is a language dependent behavior. Speech is defined as the audible manifestation of the language. By a complex and still rather mysterious process called encoding, a speaker converts an idea in his mind into a stream of sounds by moving his lips, tongue, and jaws in swift, precise manner and transmits information in order/y audible segments. When a listener decodes the signal back into an idea in his

mind that the speaker intended ï the act of oral communication is completed.

Functions of language

Research has shown that human uses language to communicate for a narrow or restricted range of purposes or functions. There are three primary functions or purposes of language: behavioral regulation, social interaction and joint attention. It is important to note that all three communicative functions are developed by approximately age 12 months in typically developing children, and are listed in hierarchical order from least social to most social.

Behavioral Regulation: This is the easiest and earliest emerging communicative function. Children use communication to request / protest, or satisfy their immediate physical needs. Behaviors such as requesting objects, requesting actions, requesting assistance and/or protest/reject objects and actions are commonly seen in children.

Social Interaction: Types of communicative behaviors to initiate, respond to, maintain, or terminate social interactions are Requesting social routines (e.g., child requesting to play "ball" and "patty-cake" games); Requesting comfort (e.g., requesting to be held when distressed); Greetings (e.g., "Hi" /"Bye"); Calling attention: (e.g., child calls attention to self through calling others); Showing off (e.g., child exhibits "show off" behaviors during games, such as peek-a-boo, dress up, etc.).

Joint Attention: These communicative acts are used to direct another's attention to an object, event, or topic of a communicative act such as Commenting (e.g., a baby looking at his parent and pointing to the sky at an airplane overhead. The child is not requesting the airplane but commenting about it, drawing another person's attention to this object); Requesting information from others (e.g., the child asks another person "Where did you go?"); Giving information to others (e.g., an individual gives information about something that is not obvious or known to another person: "I went to the fair last night").

Development of speech and language

The most intensive period of speech and language development for humans is during the first three years of life, a period when the brain is developing and maturing. These skills appear to develop best in a world that is rich with sounds, sights, and consistent exposure to the speech and language of others.

There is increasing evidence suggesting that there are "critical periods" for speech and language development in infants and young children. This means that the developing brain is best able to absorb a language, any language, during this period. The ability to learn a language will be more difficult, and perhaps less efficient or effective, if these critical periods are allowed to pass without early exposure to a language. The beginning signs of communication occur during the first few days of life when an infant learns that a cry will bring food, comfort, and companionship. The newborn also begins to recognize important sounds in his or her environment. The voice of a parent can be one important sound. As they grow, infants begin to sort out the speech sounds (phonemes) or building blocks that compose the words of their language. Research has shown that by six months of age, most children recognize the basic sounds of their native language.

As the speech mechanism (jaw, lips, and tongue) and voice mature, an infant is able to make controlled sound. This begins in the first few months of life with "cooing," a quiet, pleasant, repetitive vocalization. By six months of age, an infant usually babbles or produces repetitive syllables such as "ba, ba, ba" or "da, da, da." Babbling soon turns into a type of nonsense speech (jargon) that often has the tone and rhythm of human speech but does not contain real words. By the end of their first year, most children have mastered the ability to say a few simple words. Children are

most likely unaware of the meaning of their first words, but soon learn the power of those words as others respond to them.

By eighteen months of age, most children can say eight to ten words. By age two, most are putting words together in crude sentences such as "more milk." During this period, children rapidly learn that words symbolize or represent objects, actions, and thoughts. At this age they also engage in representational or pretend play. At ages three, four, and five, a child's vocabulary rapidly increases, and he or she begins to master the rules of language.

Milestones of speech and language development

Children vary in their development of speech and language. There is, however, a natural progression or "timetable" for mastery of these skills for each language. The milestones are identifiable skills that can serve as a guide to normal development. Typically, simple skills need to be reached before the more complex skills can be learned. There is a general age and time when most children pass through these periods. These milestones help doctors and other health professionals determine when a child may need extra help to learn to speak or to use language.

Age of Child	Typical Language Development
6 Months	-Vocalization with intonation. Responds to his name. Responds to human voices without visual cues by turning his head and eyes. Responds appropriately to friendly and angry tones.
12 Months	-Uses one or more words with meaning (this may be a fragment of a word) -Understands simple instructions, especially if vocal or physical cues are given -Practices inflection -Is aware of the social value of speech
18 Months	-Has vocabulary of approximately 5-20 words -Vocabulary made up chiefly of nouns Some echolalia (repeating a word or phrase over and over) -Much jargon with emotional content -Is able to follow simple commands
24 Months	-The child can name a number of objects common to his surroundings -Is able to use at least two prepositions, usually chosen from the following: in, on, under -Combines words into a short sentence-largely noun-verb combinations (mean) length of sentences is given as 1.2 words -Approximately 2/3 of what child says should be intelligible -Vocabulary of approximately 150-300 words Rhythm and fluency often poor Volume and pitch of voice not yet well-controlled -Can use two pronouns correctly: I, me, you, although me and I are often confused My and mine are beginning to emerge Responds to such commands as "show me your eyes (nose, mouth, hair)"
36 Months	-Use pronouns I, you, me correctly Is using some plurals and past tenses -Knows at least three prepositions, usually in, on, under -Knows chief parts of body and should be able to indicate these if not name -Handles three word sentences easily -Has in the neighborhood of 900-1000 words -About 90% of what child says should be intelligible -Verbs begin to predominate -Understands most simple questions dealing with his environment and activities -Relates his experiences so that they can be followed with reason -Able to reason out such questions as "what must you do when you are sleepy, hungry, cool, or thirsty?" -Should be able to give his sex, name, age Should not be expected to answer all questions even though he understands what is expected
48 Months	-Knows names of familiar animals -Can use at least four prepositions or can demonstrate his understanding of their meaning when given commands -Names common objects in picture books or magazines -Knows one or more colors -Can repeat 4 digits when they are given slowly -Can usually repeat words of four syllables -Demonstrates understanding of over and under -Has most vowels and diphthongs and the consonants (p, b, m, w, n) well established -Often indulges in make-believe -Extensive verbalization as he carries out activities

	-Understands such concepts as longer, larger, when a contrast is presented -Readily follows simple commands even though the stimulus objects are not in sight -Much repetition of words, phrases, syllables, and even sounds
60 Months	-Can use many descriptive words spontaneously-both adjectives and adverbs -Knows common opposites: big-little, hard-soft, heavy-light, etc -Has number concepts of 4 or more -Can count to ten Speech should be completely intelligible, in spite of articulation problems -Should have all vowels and the consonants, /m,p,b,h,w,k,g,t,d,n,ng,y/ (yellow) -Should be able to repeat sentences as long as nine words -Should be able to define common objects in terms of use (hat, shoe, chair) -Should be able to follow three commands given without interruptions -Should know his age -Should have simple time concepts: morning, afternoon, night, day, later, after, while -Tomorrow, yesterday, today -Should be using fairly long sentences and should use some compound and some complex sentences -Speech on the whole should be grammatically correct
6 Years	-In addition to the above consonants these should be mastered: f, v, sh, zh, th,1 -He should have concepts of 7 -Speech should be completely intelligible and socially useful -Should be able to tell one a rather connected story about a picture, seeing relationships between objects and happenings
7 Years	-Should have mastered the consonants s-z, r, voiceless th, ch, wh, and the soft ñgò as in ñGeorgeò -Should handle opposite analogies easily: girl-boy, man-woman, flies-swims, blunt-sharp short-long, etc -Understands such terms as: alike, different, beginning, end, etc -Should be able to tell time to quarter hour -Should be able to do simple reading and to write or print many words
8 Years	-Can relate rather involved accounts of events, many of which occurred at some time in the past -Complex and compound sentences should be used easily -Should be few lapses in grammatical constrictions-tense, pronouns, plurals -All speech sounds, including consonant blends should be established -Should be reading with considerable ease and now writing simple compositions -Social amenities should be present in his speech in appropriate situations -Control of rate, pitch, and volume are generally well and appropriately established -Can carry on conversation at rather adult level -Follows fairly complex directions with little repetition -Has well developed time and number concepts

(Source:http://www.childdevelopmentinfo.com/development/language_development.shtml)

Language development pyramid

Skills at the bottom have to be in place before the skills above them can be developed.

Language acquisition

Language acquisition is the study of the processes through which humans acquire language. By itself, language acquisition refers to first language acquisition, which studies infants' acquisition of his/her native language, whereas second language acquisition deals with acquisition of additional languages in both children and adults.

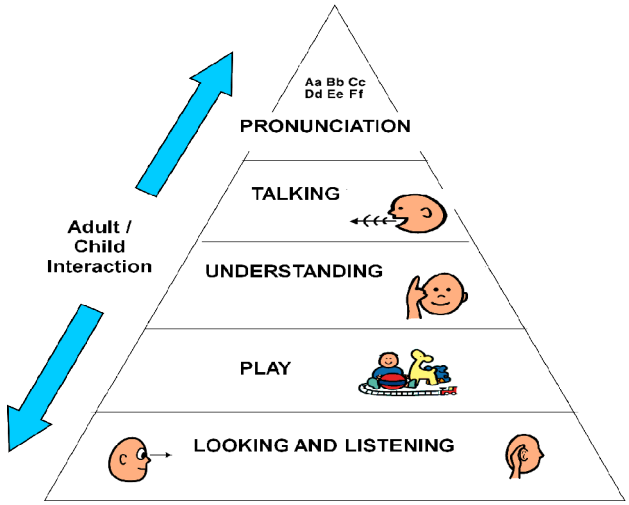


Fig.1.Language development pyramid.

Source:http://www.docstoc.com/docs/80576019/LANGUAGE-DEVELOPMENT-PYRAMID

Biological factors such as genetic or chromosomal abnormalities, hearing and oral mechanism, anatomical or functional impairment causes delay in the development. The child needs to have normal intellectual capacity, cognitive development and must have the mental capacity to think and use symbols and words in order to acquire oral language. Social factors such as a childôs life experiences with emotionally positive relationship (bonding) with a caregiver who provides reinforcement for the childôs communicative overtures; at least one speech model (person) who uses simple but well formed language patterns; and c) opportunities for exploration and a variety of day to day experiences that stimulate the urge to communicate are also known to influence speech and language development.

Theories of Language Acquisition

Over the last fifty years, several theories have been put forward to explain the process by which children learn to understand and speak a language.

Table 1 .Theories of language acquisition

Theory	Central Idea	Individual most often Associated with theory
Behaviourist	Children imitate adults. Their correct utterances are reinforced when they get what they want or are praised.	Skinner
Innateness	A child's brain contains special language-learning mechanisms at birth.	Chomsky
Cognitive	Language is just one aspect of a child's overall intellectual development.	Piaget
Interaction	This theory emphasizes the interaction between children and their care-givers.	Bruner

Behaviorism

The behaviorist psychologists observed that rats or birds, for example, could be taught to perform various tasks by encouraging habit-forming by rewarding desirable behavior. The behaviorist B. F. Skinner (1957) then proposed this theory as an explanation for language acquisition in humans. Skinner suggested that a child imitates the language of its parents or caregivers. Successful attempts are rewarded because an adult who recognizes a word spoken by a child will praise the child and/or give what it is asking for. Correct utterances are reinforced and the incorrect ones are ignored, while the unsuccessful ones are forgotten.

Limitations of Behaviorism

Language is based on a set of structures or rules, which could not be worked out simply by imitating individual utterances. The mistakes made by children such as "drinked" instead of "drank" is not simply imitating an adult but rather over-applying a rule, suggesting that children are actively working out to apply rules.

Further, it is well known that a vast majority of children go through the same stages of language acquisition following definite sequence of steps referred to as developmental milestones. The sequence seems to be largely unaffected by the treatment the child receives or the type of society in which s/he grows up. Also, that children are often unable to repeat what an adult says, especially if the adult utterance contains a structure the child has not yet started to use.

Above all, there is evidence for a critical period for language acquisition. That is, children who have not acquired language by the age of about seven will never entirely catch up. These observations do not entirely agree with the notion of behaviorism in language acquisition in children.

Innateness

Noam Chomsky (1957) argued about impoverished language input by adults who do not typically speak in grammatically complete sentences. That is, the child hears only a small sample of language yet capable of computing

complex sentences. Therefore, he opined that children must have an inborn faculty for language acquisition that is biologically determined. The human species has evolved a brain whose neural circuits contain linguistic information at birth. The child's natural predisposition to learn language known as the Language Acquisition Device (LAD) is triggered by hearing speech and the child's brain is able to interpret what s/he hears according to the underlying principles or structures it already contains.

Limitations of Chomsky's theory

Chomsky's work on language was theoretical. He did not study real children nor did he recognize the reasons why a child might want to speak, i.e., the functions of language. The theory relies on children being exposed to language but takes no account of the interaction between children and their caregivers. Hence, subsequent theories have placed greater emphasis on the ways in which normal children develop language to fulfill their needs and interact with their environment, including other people.

The Cognitive Theory

The Swiss psychologist Jean Piaget placed acquisition of language within the context of a child's mental or cognitive development. He argued that a child has to understand a concept before s/he can acquire the particular language form which expresses that concept. A good example of this is seriation. There will be a point in a child's intellectual development when s/he can compare objects with respect to size. For example, until a child is able to arrange a given number of sticks in the order of size, s/he would not be able to learn and use comparative adjectives like "bigger" or "smaller".

Limitations of the Cognitive Theory

Some studies have focused on children who have learned to speak fluently despite abnormal mental development. Syntax in particular does not appear to rely on general intellectual growth.

Input or Interactionist Theories

In contrast to the work of Chomsky, more recent theorists have stressed the importance of the language input children receive from their caregivers. Language exists for the purpose of communication and can only be learned in the context of interaction with people who want to communicate with you. Interractionists such as Jerome Bruner suggest that the language behavior of adults when talking to children (known by several names by most easily referred to as child-directed speech or CDS) is specially adapted to support the acquisition process. This support is often described to as scaffolding for the child's language learning. Bruner also coined the term Language Acquisition Support System or LASS in response to Chomsky's LAD. Colwyn Trevarthen studied the interaction between parents and babies who were too young to speak. He concluded that the turn-taking structure of conversation is developed through games and non-verbal communication long before actual word is uttered.

Limitations of Input theories

These theories serve as a useful corrective to Chomsky's early position and it seems likely that a child will learn more quickly with frequent interaction. However, it has already been noted that children in all cultures pass through the same stages in acquiring language. We have also seen that there are cultures in which adults do not adopt special ways of talking to children, so CDS may be useful but seems not to be essential. As stated earlier, the various theories should not be seen simply as alternatives. Rather, each of them offers a partial explanation of the process.

I. Choose the correct answer	II. True/False
1. This is not the function of language a. behavioral regulation b. social interaction c. joint attention d. none of the above	1 Child acquires verbs before nouns T F 2 LAD(Language Acquisition Device) is proposed as virtue of innateness T F 3 Piaget is related to biological maturation theory T F 4 First word need to be meaningful, in order to consider it as a first word T F
2. Developing brain is able to learn language easier because of a. Critical period b. Plasticity c. Both a and b d. B only	
3. Sounds in babbling stage are a. They are meaning full b. Followed by cooing sounds c. A consonant and vowel combination d. They are non repetitive	
4. Child speaks first word at a. 18 months b. 6 months c. 24 months d. 12 months	
5. Which of the following language skills develops first and forms the base of other language skills to built on it a. Semantics b. Phonology c. Pragmatics d. Syntax	Keys I d, c, c, d, c II F, T, F, T

Chapter 2

Speech and Its Components

The process of communication connects the speaker and the listener which takes place most often through the mode of speech. The process of speech production involves speech system and its components besides the nervous system and the language codes that are employed for the purpose. A schematic representation of the speech mechanism is given below.

The process of speech production is described as a chain of events that happen between a speaker and a listener sequentially to fulfill the communication act.

1.Intention :The speaker first decides to say something to another human being (or to a machine). This event takes place in the higher centers of the mind/brain.

2.Language :The desired thought passes through the language centers of the brain where it is given expression in words which are assembled together in the proper order and given final phonetic, intonational, and durational form.

3.Motor Program and Muscle Movement :The results of the language-production centers of the brain may be considered a speech motor program which executes over time by conveying firing sequences to the lower neurological centers, which in turn impart motion to all of the muscles responsible for speech production: the diaphragm, the larynx, the tongue, the jaw, the lips, and so on. Much if not all of this activity is subconscious, and involves constant corrective feedback (Denes & Pinson ,1973)

4.Airstream in the Vocal Tract: As a result of the muscle movements, a stream of air emerges from the lungs, passes through the vocal cords where a phonation type (e.g. normal voicing, whispering, aspiration, creaky voice, or no shaping whatsoever) is developed, and receives its final shape in the vocal tract before emerging from the mouth and the nose and through the tissues of the face.

5.Sound Wave in Air: The vibrations caused by the vocal apparatus of the speaker radiate through the air as a sound wave.

6.Electronic Transduction: The sound wave may be converted to analog or digital form for storage or transmission, and in the form of electric waves may be transported thousands of miles to its destination, where the information in the electric waves is converted back to the form of sound. It is in the form of an electronic copy of the original sound wave that automatic speech recognition by computer gains access to speech data.

7.Hearing :The sound wave, which may have passed through electronic coding and decoding, eventually strikes the eardrums of another human being, where it is first converted to waves on the surface of the tympanum membranes, next to mechanical motion via the ossicles of the middle ear, then to fluid pressure waves in the medium bathing the basiliar membrane of the inner ear, and finally to firings in the 30,000 neural fibers which combine to form the auditory nerve.

8.Auditory and Language Processing :The lower centers of the brainstem, the thalamus, the auditory cortex, and the language centers of the brain all cooperate in the recognition of the phonemes which convey meaning, the intonational and durational contours which provide additional information, and the vocal quality which allows the listener to recognize who is speaking and to gain insight into the speaker's health, emotional state, and intention in speaking.

9.Understanding: The higher centers of the brain, both conscious and subconscious, bring to this incoming auditory and language data all the experience of the listener in the form of previous memories and understanding of the current context, allowing the listener to ``manufacture'' in his or her mind a more or less faithful ``replica'' of the thought which was originally formulated in the speaker's consciousness and to update the listener's description of the current state of the world. The listener may in turn become the speaker, and vice versa, and the speech chain will then operate in reverse.

Speech Production

From the technical, signal-oriented point of view, the production of speech is widely described as a two-level process (Koreman, 1996). In the first stage the sound is initiated and in the second stage it is filtered on the second level (Fant, 1960; Titze, 1994, Stevens, 1997). This distinction between phases has its origin in the source-filter model of speech production (Fant, 1960).

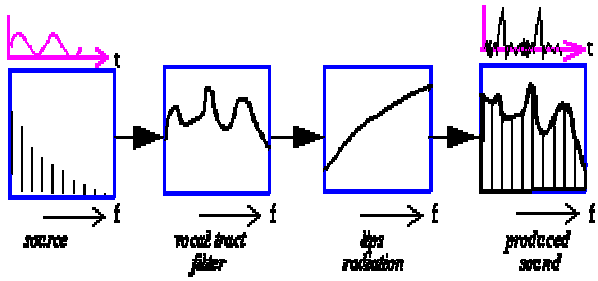


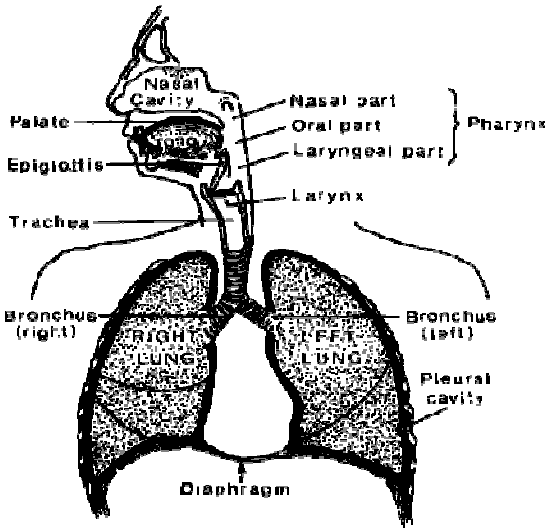
Fig.2. Source filtering nature of vocal tract

Source:http://www.rothenberg.org/Sourcetractvq/Sourcetractvqprinterfriendly.htm

The basic assumption of the model is that the source signal produced at the glottal level is linearly filtered through the vocal tract. The resulting sound is emitted to the surrounding air through radiation loading (lips). The model assumes that source and filter are independent of each other. Although recent findings show some interaction between the vocal tract and a glottal source (Rothenberg 1981; Fant 1986), Fant's theory of speech production is still used as a framework for the description of the human voice, especially as far as the articulation of vowels is concerned.

From the linguistic phonetic point of view, the production of speech is regarded as a superposition of initiation, phonation, articulation and prosodic organization processes (Laver, 1994). An overview of the physiological constraints on speech production will be given later in this section. The organs involved in the production of speech are depicted in the Figure 3.

Fig.3. The production of speech sounds - lungs, glottis, vocal tract (from: Borden *et al*., 1994:64).



A. The Production of Speech Sounds

Although the production of speech sounds appears to be a simple act, it involves a complex set of events that differ distinctly for distinct types of speech sounds such as vowels and consonant sounds. There is a common notion that speech act begins in the lungs and carried forward up to lips. But, since there is a need to get the signal to speak and speak appropriately, the entire act starts in the brain with the creation of the message. A representation of the sound sequence and a number of commands to be executed by the speech organs to produce the utterance called as phonetic plan of a motor plan (Belinchón, Igoay Rivière, 1994) is initiated at the level of brain. After this mental operation, physical production of sounds for speech begins with the air stream from lungs, which goes through the trachea and the oral and nasal cavities. It involves four processes: Initiation, phonation, oro-nasal process and articulation.

The initiation process is the moment when the air is expelled from the lungs. The phonation process occurs at the larynx. The larynx has two horizontal folds of tissue in the passage of air; they are the vocal folds. The gap between these folds is called the glottis.

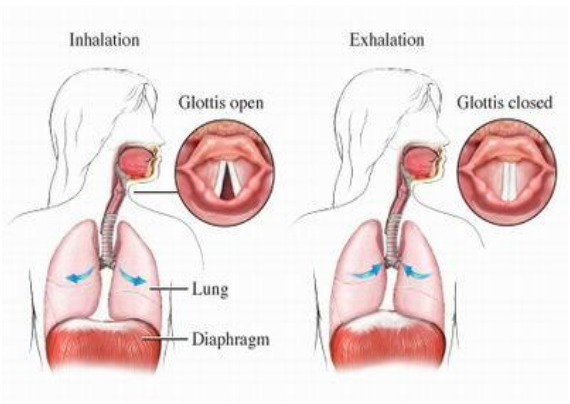


Fig 4a. Closed glottis Fig 4b. Open glottis

Fig: 4c. The larynx

Fig.4. Larynx

The glottis can be closed, as in figure 4a. Then, no air can pass. Or it can have a narrow opening which can make the vocal folds vibrate producing the ñvoiced soundsò such as /b/ as in óbatô. Finally, it can be wide open, as in normal breathing, and, thus, the vibration of the vocal folds is reduced, producing the ñvoiceless soundsò such as /p/ as in ócapô. , During the production of nasal speech sounds (/m/, /n/, /ng/) the air passes into the nasal cavity while for oral speech sounds (/p/, /t/, /k/), the air passes through the oral cavity. The velum is the part responsible for the selection of either oral or nasal passages (Figure 5). Through the oro-nasal process one differentiates between the nasal and the oral sounds. .

Finally, the articulation is the most significant process. It takes place in the mouth and it is the process that helps one to differentiate most speech sounds. In the mouth the oral cavity acts as a resonator, and the articulators-the upper and lower lips, upper and lower teeth, tongue (tip, blade, front, back) and roof of the mouth (alveolar ridge, palate and velum), a few that are active and others passive articulators, which can be active or passive: contribute for the production of speech sounds on the basis of the place (where) and the manner (how) they are articulated.

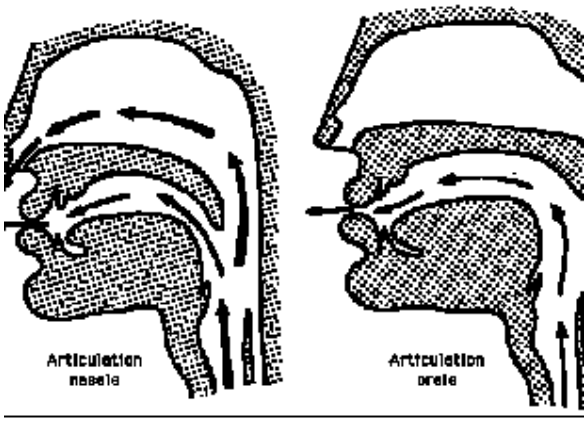


Fig 5. The oro-nasal process

Source:http://xeno-lovegood.blogspot.in/2010_11_01_archive.html

The systems involved in Speech Production

Speech is an acoustic signal that is used for the purpose of communication The acoustic signals may form structures at the level of syllables, words, phrases, sentences, etc. These may convey the speakerôs emotional or physical state, mark grammatical structure, or help to control the dialogue between two or more speakers. Some knowledge of the various physiological systems involved is necessary to understand speech production. The three major systems of the body involved in speech production are the respiratory system, the phonatory system, and the articulatory system. The respiratory system, which consists of the lungs, chest wall and diaphragm (Figure, 5), provides the airflow and aerodynamic energy; the phonatory system generates periodic acoustic energy and is used for some other functions, such as the articulation of the glottal stop, and the articulatory system controls the overall spectral envelope and thus the sound quality.

The Respiratory System

Breath can be thought of as two simple processes wherein while the the chest expands, air is drawn into the lungs (inhalation) and the chest compressed, air gets pushed out of the lungs (exhalation).

The Physics of Breathing

Receiving various signals from the nervous system, the diaphragmatic muscles contract and the diaphragm moves downward. As the diaphragm depresses, it creates a vacuum in the lungs and air rushes in to fill it. As the diaphragm relaxes, it pushes the molecules closer together, increasing the internal pressure in the lungs. The air flows from the lungs into the lower pressure outside the body.

Or in other words...

Inhalation

- diaphragm contracts and drops

- lung volume gets larger, creating a negative pressure difference
- air rushes in

Exhalation

- diaphragm relaxes and rises
- lung volume decreases, creating a positive pressure difference
- air rushes out

The two basic ideas involve either in the production of speech , voice:

1."supporting" the breath by compressing the abdomen during phonation (i.e., on the exhalation),

2. its opposite, relaxing the abdominals as much as possible during inhalation and phonation, allowing the diaphragm to work on the inhalation, and riding its relaxation on the outgoing breath (i.e., phonation).

The flow of air into and out of the lungs is controlled mainly by the intercostals muscles, which connect the ribs together (Ladefoged, 1967). The external intercostals are connected so as to lift the rib cage outwards when they are activated, thus expanding the production of speech requires a constant sub-glottal pressure of 6-10 cm H2O to be maintained against the aerodynamic resistance of the larynx and/or vocal tract. The rate of air flow is less than that occurs in normal breathing, so muscular activity must be involved at lung volumes above the equilibrium point to resist the normal elastic forces. As the intensity and pitch of voiced sounds is strongly dependent on sub-glottal pressure, there must be constant and very precise adjustments of muscle tensions to control prosodic aspects of the speech .

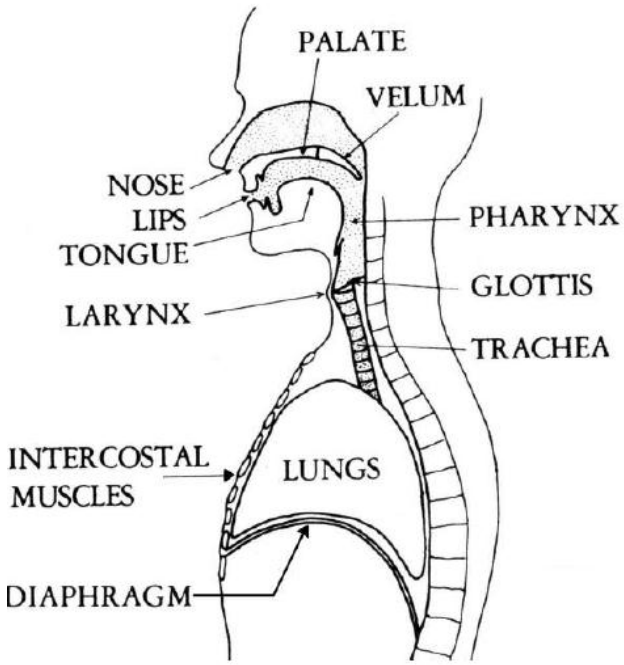


Fig.6. Major parts of vocal system

Source: http://www.indiana.edu/~hlw/PhonUnits/vowels.html

The breath stream rises up the trachea from the lungs and runs into a constriction. This is the "voice box" where the vocal chords - now called folds - are set in motion by the breath stream and they create a buzz. It is important to realize that it is the puffs of air that create the sound, not the impact of the folds coming together. It is more similar to waving your hand in front of your ear, which creates waves of air pressure or turbulence, than clapping your hands together. It is important to remember that speech is not only made of phonated sound. In fact there are many sound sources in speech.

Sound Sources

1.The vibrating vocal folds, (a pure, spoken "ah", for instance)

2.Turbulence caused by constriction, ("shush"ing someone)

3.Blocked air flow (glottal stops & unreleased plosive consonants [k, p, t]).

4.In this latter case, our minds interpret the silence, or absence of sound, as a sound unit.

Phonation occurs in the **larynx**. The larynx is a complex structure of cartilage, ligament and muscle, situated at the top of the trachea. It may have originated as a simple sphincter to close off the trachea to prevent food or water from entering the lungs, but has evolved into a highly specialised organ of speech. The vocal folds, consisting of muscle and ligament, stretch across the opening of the larynx and are capable of closing it off completely by being brought together (*adduction*), or of being opened (*abduction*) sufficiently to allow relatively unrestricted airflow. In addition there is a continuum of states between being tightly adducted and wide open; during production of voiced speech, the folds are adducted lightly. In this state, the increased air pressure in the lungs is capable of forcing the vocal folds apart. Once one understands how the stream of air is chopped up to make the waves of sound, it is quite simple to grasp the different ways in which that sound can be modified to change the pitch (i.e., singing high or low), the intensity (volume) or to switch registers.

How Vibration Happens

The Bernoulli Effect is the scientific principle that draws the vocal folds together. The Bernoulli Effect is all around us. It is the main principle of lift, which causes airplanes to fly, and baseballs to spin. A simple example of how the Bernoulli Effect works is experienced by a bicycle commuter everyday: riding along, a large truck passes her. Its speed creates an area of lower pressure, it draws in the surrounding air as it passes the cyclist, who feels as if s(he) is being sucked toward the truck. The flow is constricted in a very narrow nozzle. Above the nozzle is a small hole, which draws in air to create a vacuum in experiments.

The vocal folds are also drawn in by the Bernoulli Effect. The intrinsic muscles of the larynx bring the vocal folds together, they "approximate" them, so that the space between the folds, the glottis, is essentially closed off. Once they are closed, the air stream creates a pressure against the closed vocal folds until they are blown apart. As the air rushes through the very narrow, constricted opening, it must accelerate to get through. This high speed air, much like the truck in the example above, creates suction perpendicular to the direction of its flow -- it draws the side of the opening in.

"The Wave" - the simultaneous actions of the vocal folds and the mucosal wave
The vocal folds move in a wave-like manner, opening and closing in three dimensions:

- the glottis opening from back to front
- the folds undulating back to front
- the folds undulating vertically, bottom edges open first and close first

1) Pitch Change

- Fundamental Frequency: when speaking or singing there is always an underlying "note" to each sound. That pitch is defined as the average rate of vocal fold vibration and is measured in cycles per second, or Hertz.
- Males & females are roughly an octave apart.
- For pitch to rise, the vocal folds must vibrate more quickly. To do this, the folds get thinner by being stretched longer.
- Extrinsic muscles manipulate the cartilages to make the folds tense and raise the pitch.
- Pitch can be lowered by the muscles drawing the cartilages closer together, relaxing the folds.

Intensity Change

If frequency (pitch) is the number of waves of high and low pressure, intensity is the size of the wave, which controls "volume". As we get louder:

- the folds don't open any further than usual, but they stay closed longer, creating more distinct "puffs of air" - a greater difference in the low and high pressure levels
- the folds are pressed together more firmly
- we create high, sub-glottic pressure against the folds to compensate
- articulation affects the potential pressure difference - e.g. it is impossible to shout on /m/ because the restriction of the airflow (the air must go through the nose on /m/) and so there is a limit to intensity one can make.

2) Modes of Vibration

Regular or Modal: sometimes called chest-tone

- this is the normal vocal fold vibration we have discussed so far

Falsetto: sometimes called *head-tone*

- only the free edges of the folds vibrate
- posterior part doesn't vibrate but is held tense
- result is often slightly breathy because the folds don't necessarily touch

Glottal Fry

- folds are held together tightly
- free edges bubble the sound out
- wave pattern is unusual
- idling chainsaw or popcorn sound

3) Registers

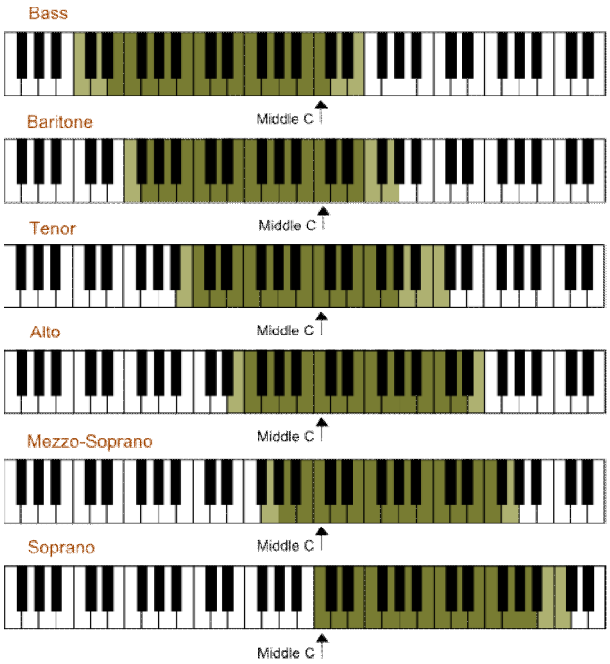


Fig: 7. various registers

Source: http://www.singwise.com/cgi-bin/main.pl?section=articles&doc=UnderstandingVocalRangeRegistersAndType

Registers tend to mean the type of voice, especially in singing. A signer may use a low to high register or high to low register in their singing to vitalize the song.

Resonation

The buzz created by the vocal folds resonates (vibrates) the air column and this in turn causes the structures above and around the larynx to vibrate/resonate as well.

Remember from Phonation that the vocal folds vibrate and chop the air stream into little puffs of air. The rate or frequency at which these puffs come out is very fast - from 32 cycles per second or Hertz (Hz) for a very low bass to 3136 Hz for a very high soprano. We speak somewhere between 98 Hz and 262 Hz. This rate is called the fundamental frequency.

Almost anything can vibrate, and will vibrate at a *natural frequency*, that is at a rate that is most conducive to its vibrating. A good example of natural frequency can be seen on a backyard swing: no matter how hard you push the swing, the rate of frequency of swinging is always the same, no matter how far you travel each time. Another familiar example is the tuning fork. It vibrates most powerfully and the longest at its natural frequency. In the same way, the various structures and tissues of the body, resonate more easily at certain pitches. You can feel this by tilting your head back and saying, in a low voice, "Awwwww". Put a hand on your chest and feel it rumble. Now tilt your head forward, place a hand on your head and say, "Heeeeeeeeee" in a high voice. Feel the vibrations in your skull?

The parts of the body that can vibrate in harmony with the voice are often called Resonators.

The Air Column

Extending from your larynx to your lips, the air column vibrates at a natural frequency - in much the same way that the pipes of an organ do. As you shorten the organ pipe, and thus the air column, the pitch gets higher. Try blowing across a bottle and then adding water and blowing again - observe how the pitch rises. In speech, the rate of vibration of the *vocal folds* creates the fundamental frequency, or pitch of the sound. The frequency or frequencies at which the *air column* vibrates determines the *quality* of the tone.

In fact, the air column from the larynx to the lips functions very much like a uniform tube, without much variation in width. In an average adult, the tube is approximately 17.5 cm long in adult males and 14.7 cm long in adult females

The sound created by the vocal folds isn't a pure tone - it is complex. It is made up of the fundamental frequency (the rate at which the folds vibrate) and a number of *partials*, which are harmonics of the fundamental frequency, vibrating 2 times, 3 times, 4 times, etc. as fast as the fundamental. Our voices are made up of a spectrum of the fundamental and these "overtones".

Formants

Physics tell us that our tube, which functions as if it is closed at one end (since the larynx closes it off at the bottom), naturally resonates at the odd numbered multiples of the fundamental. That is, if the fundamental is 100 Hz, the partials resonate at 300Hz, 500Hz, 700Hz, etc... These "standing-waves" of sound are also known as *formants*, and are labelled F_0 for the fundamental frequency, F_1 for the first formant, F_2 for the second formant, F_3, etc. In shaping speech, the first three formants are most important. In a way, it is as if each vowel is a "chord" -- like playing three notes together on the piano, where the bottom note stays the same and the notes above change."The rate of vibration of the vocal folds creates the fundamental frequency, or pitch of the sound. The frequency or frequencies at which the air column vibrates determines the *quality* of the tone."

What we recognize as "vowels" are actually changes in the quality of the tone. Our tongues allow us to change the shape of the "tube", specifically changing the cross-sectional "width" by sliding forward or back.

- Move your tongue forward into an [i] /"EE" (as in "reed") position: feel how your mouth is narrowed by your tongue just behind your teeth?

- Try shortening it by pulling back into an [u]/"oo" (as in "mood"): the tongue is pulled back here. (Notice how the degree of lip-rounding also affects the sound?)

- Try going back and forth from "EE" to "oo", keeping the same pitch throughout. As you tongue slides back towards the "oo" you may hear how part of the sound drops in pitch, even though your F_0, fundamental frequency remained the same.

Lip-rounding essentially lengthens the tube; modify the first, F_1 formant. (The middle of our tongues primarily shapes the F_2 formant, and our tongue tips shape the F_3 formant.

- You can hear that by saying "uh" and "er", lifting and lowering your tongue tip.

The use of harmonics can be emphasized and focused to make a beautiful form of singing, called Overtone Singing. There are many styles of this, including the chanting of Tibetan.

Resonators: The following areas vibrate "sympathetically" with the air column. The way in which each area vibrates acts as a cue to the quality of the sound created, giving tactile motor feedback to the brain, this works in conjunction with the hearing mechanisms.

What is perceived or described by voice teachers as "placement" of the voice, generally describes how the vibration of the air column interacts with these structures to accentuate or diminish the size of the second and third formants (F2 and F_3). The term "placement" indicates where one feels the augmented vibration due to the change the relationship of the formants to areas of the body.

The following is a list of Resonators and the pitches or vocal qualities that most easily activate them

- Chest and Lower Body - low pitches and open sounds ("AW")
- Throat - mid-range, easy speaking tone
- Mouth - upper mid-range, mid-vowels
- Nasal - close, front vowels, especially when followed by a nasal consonant
- Facial - high range, front vowels
- Sinus - given that there are so many sinuses, many different quality sounds activate them
- Bones of the skull - falsetto, very high range, closed vowels.

Articulation

Once the airstream is created (respiration), it sets the vocal folds into action, creating a buzz (phonation), and that buzz is modified by the airspace above the larynx (resonation). Now the air and vibration passing through the vocal tract are shaped by the articulators into speech sounds. The articulatory system consists of the tongue, lips, velum, jaw, teeth and palate (Figure 2-3). The palate and upper teeth are sometimes referred to as passive articulators (Laver, 1994) because they do not move, but provide fixed surfaces against which the active articulators (the tongue, lips, jaw and velum) operate. These control the shape of the oral cavity, connections to the nasal cavity thereby controlling the degree to which the various frequencies present in the excitation signal are amplified or attenuated. In the case of vowels, the articulatory system only modifies the sound produced by the vocal folds, but in certain consonants, notably the fricatives in English, it also supplies the excitation. Some other languages include non-pulmonic sounds such as clicks, in which the airflow is not generated by the respiratory system,but within the articulatory system. The jaw is the carrier of the tongue, lower lips and lower teeth, and its movements during speech are largely to extend the range of movements of the tongue and lips (Laver, 1994).

Regulation

Respiration, Phonation, resonation and articulation all these diverse processes that combined to produce speech are regulated by the nervous system. Air flow and voicing must be programmed to match the speech sound requirements, word and word meaning must be retrieved from storage and formulated into acceptable units, and then the whole activity must be monitored as it occurred to determine if the form and content of the message fulfill the speakerôs communicative intent. And yet the central and

peripheral system work so swiftly and smoothly that they make the act of talking look simple.

Unlike all other component of the speech chain ,that are temporarily borrowed from their basic biological functions ,the central nervous system has specialized segments that fulfill the sole purpose of the receiving or organizing and formulating message. The system is extremely complex and that much still remains to be discovered about how the 14 billion neurons regulate oral language. The cortex or thin bark of the hemispheres of brain has an amazing capacity to store information. There are 2 kinds of memory system termed as long term memory which is important for formulating messages and a very brief and short term memory which is essential for tracing incoming message, remembering and sequencing items dictated and monitoring what we ourselves have said. Persons with aphasia show losses in both long term and short term memory.

The central nervous system is also the motor command centre. It is the site for originating planning and carrying out the transmission of the messages. The command centre for integrating the language is the left hemisphere, regardless of the personôs handedness. When the maturation of the central nervous system is delayed child will be slow to talk. There is cerebrum and cerebellum which controls the integration of the motor impulses and thus leads to coordination of speech. The nervous system responsible for processing information detection of, attending to and patterning of incoming message are only a few functions of this component. The structure of the ear has the primary responsibility for information processing and its importance to speech is obvious.

Self test

I. Choose the correct answer	**II. True or false**
1. Which of the following sequence is correct with reference to communication? a. Intention understanding hearing b. Hearing - Auditory and Language Processing - Understanding c. Hearing - Understanding - Auditory and Language Processing d. Intention -Sound Wave in Air - Airstream in the Vocal Tract	1 Velopharynx is open for nasal speech sounds T F 2 Larynx is the major articulator for producing speech sounds T F 3 All languages have eggressive air stream as the basis for speech production T F 4 Burst is the feature of nasal sounds T F
2. According to Fantôs theory of speech production, which is the energy radiating element a. Larynx b. Lips c. Tongue d. Vocal tract	5 The commanding system for speech production is spinal cord. T F
3. The source of speech is a. Air from atmosphere b. Air from larynx c. The nasal air d. Pulmonic air	
4. The dual functions of human larynx are a. Reflux and phonation b. Phonation and chewing c. Deviating air through nasal cavity and phonation d. None of the above	

5. Which of the following helps passive inhalation? a. Negative air inside the lungs b. Negative air in atmosphere c. Positive air inside the lungs d. Positive air in troposphere	
	Keys I. b, b,d,a,a II. T,T,T,F,F

Chapter 3

International Phonetic Alphabet

International Phonetic Alphabet (IPA) Origin

The IPA was first published in 1888 by the Association Phonétique Internationael (International Phonetic Association), a group of French language teachers founded by Paul Passy. The aim of the organization was to devise a system for transcribing the sounds of speech which was independent of any particular language and applicable to all languages.

A phonetic script for English created in 1847 by Isaac Pitman and Henry Ellis was used as a model for the IPA.

Uses

- The IPA is used in dictionaries to indicate the pronunciation of words.

- The IPA has often been used as a basis for creating new writing systems for previously unwritten languages.

- The IPA is used in some foreign language text books and phrase books to transcribe the sounds of languages which are written with non-latin alphabets. It is also used by non-native speakers of English when learning to speak English.

International Phonetic Alphabet (IPA) ˌɪntəˈnæʃnəl fəˈnɛtɪk ˈælfəˌbɛt

Consonants (pulmonic)

	Bilabial	Labio-dental	Dental	Alveolar	Post-alveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k g	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or flap		ⱱ		ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Where symbols appear in pairs, the one on the right represents a voiced consonant, while the one on the left is unvoiced. Shaded areas denote articulations judged to be impossible.

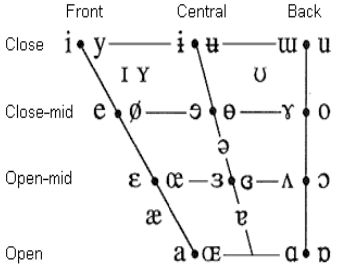
Consonants (non-pulmonic)

Clicks	Voiced implosives	Ejectives
ʘ bilabial	ɓ Bilabial	’ examples:
ǀ Dental	ɗ Dental / alveolar	pʼ Bilabial
ǃ (Post) alveolar	ʄ Palatal	tʼ Dental / alveolar
ǂ Palatal-alveolar	ɠ Velar	kʼ Velar
ǁ Alveolar lateral	ʛ Uvular	sʼ Alveolar fricative

Other symbols

ʍ w	Voiceless / voiced labial-velar approximants
ɥ	Voiced labial-palatal approximant
ʜ ʢ	Voiceless / voiced epiglottal fricatives
ʡ	Epiglottal plosive
ɕ ʑ	Voiceless / voiced alveolo-palatal fricatives
ʃ͡ʒ	simultaneous X and ʃ
k͡p	Affricatives and double articulations can be represented by two symbols and joined by a tie bar if necessary
t͡s	

Vowels



Where symbols appear in pairs, the one to the right represents a rounded vowel.

Suprasegmentals

ˈ	Primary stress
ˌ	Secondary stress
eː	Long
eˑ	Half-long
ĕ	Extra-short
‖	Minor (foot) break
‖	Major (intonation) break
.	Syllable break
‿	Linking (no break)

Tones and word accents

Level tones		Contour tones	
e̋ or ˥	Extra high	ě or ˧˥	Rising
é ˦	High	ê ˥˧	Falling
ē ˧	Mid	e᷄ ˦˥	High rising
è ˨	Low	e᷅ ˩˧	Low rising
ȅ ˩	Extra low	↑	Upstep
		↓	Downstep

Contour tones	
ê or ˥˩	High falling
ȇ ˧˩	Low falling
e᷈ ˥˩˧	Rising falling
e᷉ ˩˧˥	Falling rising
↗	Global rise
↘	Global fall

Diacritics

n̥ d̥ Voiceless	tˠ dˠ Velarized	dˤ No audible release	e̙ Retracted tongue root
s̬ d̬ Voiced	tˤ dˤ Pharyngealized	n̩ Syllabic	e̹ More rounded
tʰ dʰ Aspirated	b̤ a̤ Breathy voiced	ẽ Nasalized	e̜ Less rounded
t̪ d̪ Dental	b̰ a̰ Creaky voiced	ɚ Rhoticity	u̟ Advanced
t̺ d̺ Apical	t̼ d̼ Linguolabial	e̯ Non-Syllabic	e̠ Retracted
t̻ d̻ Laminal	ɬ Velarized / pharyngealized	e̝ Raised	ë Centralized
tʷ dʷ Labialized	dⁿ Nasal release	e̞ Lowered	e̽ Mid-centralized
tʲ dʲ Palatalized	dˡ Lateral release	e̘ Advanced tongue root	

Pronunciation

The sounds represented here are those of British English spoken with an R.P. (Received Pronounciation) accent. Other varieties of English differ considerably in pronunciation, especially the vowels and diphthongs.

Vowels

ɑː **f**a**th**er [ˈfɑːðə], **a**lms [ɑːmz], cl**e**rk [klɑːk], h**ea**rt [hɑːt], s**e**rgeant [ˈsɑːʤənt]
æ c**a**t [kæt], pl**ai**t [plæt]
ɛ b**e**t [bɛt], **a**te [ɛt], b**u**ry [ˈbɛrɪ], h**ei**fer [ˈhɛfə], s**ai**d [sɛd], s**ay**s [sɛz]
ə p**o**tter [ˈpɒtə], al**o**ne [əˈləʊn], fam**ou**s [ˈfeɪməs], nat**io**n [ˈneɪʃən], th**e** [ðə]
ɜː f**er**n [fɜːn], b**ur**n [bɜːn], f**ir** [fɜː], l**ea**rn [lɜːn], t**er**m [tɜːm], w**or**m [wɜːm]
ɪ pr**e**tty [ˈprɪtɪ], b**ui**ld [bɪld], b**u**sy [ˈbɪzɪ], n**y**mph [nɪmf], p**o**cket [ˈpɒkɪt], s**ie**ve [sɪv], w**o**men [ˈwɪ
iː s**ee** [siː], **ae**sthete [ˈiːsθiːt], ev**i**l [ˈiːvᵊl], magaz**i**ne [ˌmægəˈziːn], rec**ei**ve [ɹɪˈsiːv], s**ie**ge [siːʤ]
ɒ p**o**t [pɒt], b**o**tch [bɒʧ], s**o**rry [ˈsɒrɪ]
ɔː th**aw** [θɔː], br**oa**d [brɔːd], dr**aw**er [ˈdrɔːə], f**au**lt [fɔːlt], h**a**lt [hɔːlt], **or**gan [ˈɔːgən]
ʊ p**u**ll [pʊl], g**oo**d [gʊd], sh**ou**ld [ʃʊd], w**o**man [ˈwʊmən]
uː z**oo** [zuː], d**o** [duː], q**ueue** [kjuː], sh**oe** [ʃuː], spe**w** [spjuː], tr**ue** [tuː], y**ou** [juː]
ʌ c**u**t [kʌt], fl**oo**d [flʌd], r**ou**gh [rʌf], s**o**n [sʌn]

Diphthongs and triphthongs

aɪ d**i**ve [daɪv], **ai**sle [aɪl], g**uy** [gaɪ], m**igh**t [maɪt], r**ye** [ɹaɪ]
aɪə **fir**e [ˈfaɪə], b**uyer** [ˈbaɪə], l**iar** [ˈlaɪə], **tyr**e [ˈtaɪə]
aʊ **ou**t [aʊt], b**ough** [baʊ], cr**ow**d [kɹaʊd], sl**ou**ch [slaʊʧ]
aʊə **flour** [ˈflaʊə], **cower** [ˈcaʊə], **flower** [ˈflaʊə], **sour** [ˈsaʊə]
eɪ p**ai**d [peɪd], d**ay** [deɪ], d**eig**n [deɪn], g**au**ge [geɪʤ], gr**ey** [gɹeɪ], n**eigh** [neɪ]
ɛə b**ear** [bɛə], d**are** [dɛə], pr**ayer** [pɹɛə], st**airs** [stɛəz], wh**ere** [wɛə]
ɪə t**ear** [tɪə], b**eer** [bɪə], m**ere** [mɪə], t**ier** [tɪə]
oʊ n**o**te [noʊt], b**eau** [boʊ], d**ough** [doʊ], h**oe** [hoʊ], sl**ow** [sloʊ] y**eo**man [ˈjoʊmən]
ɔɪ v**oi**d [vɔɪd], b**oy** [bɔɪ], destr**oy** [dɪˈstrɔɪ]
ʊə p**oor** [pʊə], sk**ewer** [ˈskjʊə], s**ure** [ʃʊə]

Vowels: These are produced in a relatively open vocal tract and all require laryngeal tone (voicing).The contours of our tongue vary with each vowel for there are front, middle and back vowels. Each vowel family having several members distinguished by the height of the tongue constriction and the amount and rounding of the lip opening. Thus the /u/ vowel as in flute /flut/, for example, is the highest back vowel and has the narrowest lip rounding. While the ee/i/ is the highest front vowel. Notice, how your jaw opens and closes again when you utter the vowels /i/ , /a/ and then /u/.The central vowels such as /ş / or / Ʊ are produced with the tongue lying in an almost neutral or nearly relaxed position on the floor of the mouth cavity, although there is considerable variation from individual to individual in the production of both vowels and consonants.

Diphthongs: A diphthong, in the simplest sense, is a phoneme that involves the combination of two different vowel sounds. For example the second phoneme in the word ócowô is diphthongs that begins as the vowel /a/ and end as the vowel /U/.As you say this diphthong aloud, you will indeed feel the changing postures of your tongue and lips as you move from one vowel into the next. Some of the vowels tend routinely to be dipthongized. If they are at all prolonged or emphasized in a word. Some versions of the IPA will show /ei/ and /ou/ diphthongs, for example .Prolong your utterance of a /e/ or /o/ to feel for yourself the shifting positions.

Consonants: Children generally learn all these different postures, contours and coordination for uttering vowels with very little difficulty, and they learn them very early, but deaf children may never get some of them right in a life time. Because they require greater precision in placement of the tongue and proper direction of the air stream, learning to produce consonant sound acceptably is a bit more difficult. Although there are great number of possible hisses, clicks and explosions which could be used for speech, most children learn the correct place and manner of articulation and voicing characteristics for uttering the consonants of their language. The table given below shows consonants of English language.

Various consonants are classified on the basis of place and manner of articulation.

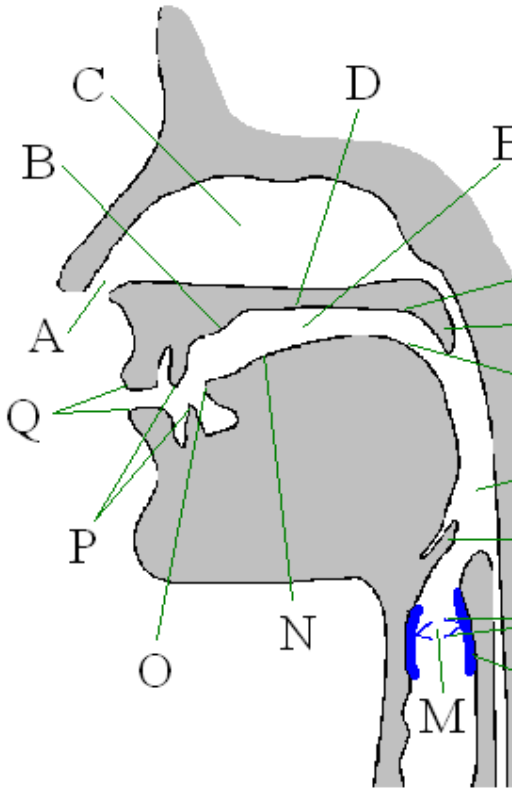
Place of articulation refers to the anatomical site where the breath stream is interrupted or constricted to produce a speech sound .There are seven valve sites along the vocal tract :

Consonants

p	**p**ig [pɪg] b **b**ig [bɪg] t **t**ea [ti:] d **d**actylology [ˌdæktɪ'lɒlədʒɪ]
k	**k**angaroo [ˌkæŋgə'ɹu:], **c**acophony [kə'kɒfənɪ]
g	**g**et [gɛt], **gh**oul [gu:l], **gu**ard [ga:d], e**x**amine [ɪ'gzæmɪn]
m	**m**a**mm**oth ['mæməθ]
n	**n**yctophobia [ˌnɪktəʊ'fəʊbɪə], **kn**owledge ['nɒlɪdʒ], **gn**otobiotics [ˌnəʊtəʊbaɪ'ɒtɪks], **pn**eumatic [nju'mætɪk]
ŋ	si**ng** [sɪŋ], phary**n**x ['fæɹɪŋks]
ɹ	**r**adio ['ɹeɪdɪəʊ], **rh**inoceros [ɹaɪ'nɒsərəs / ɹaɪ'nɒsrəs]
f	**f**oxtrot ['fɒksˌtrɒt], **ph**oenix ['fi:nɪks] v **v**arious ['veəɹɪəs]
θ	**th**in [θɪn] ð **th**ese [ði:z]
s	**s**illy ['sɪlɪ], **c**ircus ['sɜ:kəs] z **z**ebra ['zi:bɹə / 'zɛbrə], **X**ero**x** ['zɪəɹɒks]
ʃ	**sh**ip [ʃɪp], elec**ti**on [ɪ'lɛkʃən], ma**ch**ine [mə'ʃi:n], mis**si**on ['mɪʃən], pres**su**re ['pɹɛʃə], **sch**edule ['ʃɛdju:l]
ʒ	trea**s**ure ['tɹɛʒə], a**z**ure ['æʒə], eva**si**on [ɪ'veɪʒən]
h	**h**otel [həʊ'tɛl]
l	**l**ateral ['læteɹəl]
j	**y**es [jɛs], oni**on** ['ʌnjən], vi**gn**ette [vɪ'njɛt]
ʧ	**ch**ew [ʧu:], na**t**ure ['neɪʧə]
ʤ	**j**aw [ʤɔ:], a**dj**ective ['ædʒɪktɪv], sol**di**er ['səʊlʤə], usa**ge** ['ju:sɪʤ]
w	**w**et [wɛt], **wh**eel [wi:l]

.

Sources for all IPA related tables: http://dialectblog.com/the-international-phonetic-alphabet/ipa-tutorial/lesson-2/



A - Nose J - Epiglottis

B - Alveolar ridge K - vocal folds

C - Nasal cavity L - Larynx

D - Hard palate M - glottis

E - Oral cavity N - Blade of the tongue

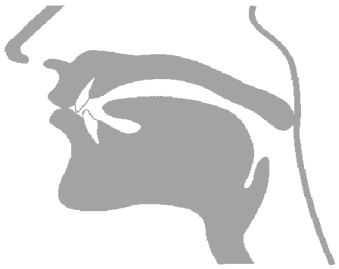
F - velum O - Tip of the tongue

G - uvula P - Teeth

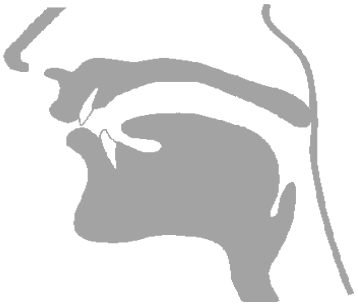
H - Back of the tongue Q - Lips

I - Pharynx / Pharyngeal cavity

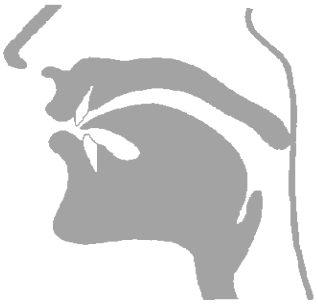
Bilabial: Sounds (/p/, /b/, and /m/) are made with lips pressed together.



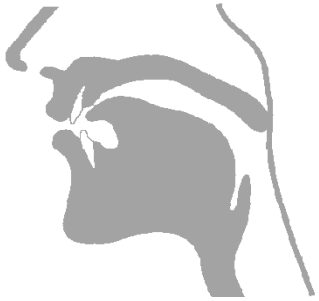
Labiodentals: Only two sounds,/f/ and /v/ , are produced by placing the upper teeth on the lower lip and blowing air through the narrow slit.



Dental: The / ' / as in thin /' In/ and the /ŭ/ as in them / ŭEm/ are made by forcing the airstream through a narrow slit between the tongue tip and the teeth.



Alveolar: These sounds are made by moving the tongue tip upward and forward to make contact with the upper gum(or alveolar) ridge then at another articulatory port .



Palatal: The /j/ as in Yale/jel/, /l/and in bell /bEl/ ,/Ű as in ship /ŭp/, and /Ʂ / as in rouge /ruƧ / are all produced by lifting the tongue tip to the hard palate.

Velar: The sound (/ɐ/,/g/,and/k/)are made by lifting the back of tongue upto the soft palate (velum).

Sources for place of articulation: http://www-01.sil.org/mexico/ling/glosario/E005ci-PlacesArt.htm

Glottal: Only one legitimate English speech sound /h/ is made by simply blowing air between the vocal folds. Children who cannot close their soft palates sufficiently to make velar sounds often substitute a glottal stop/?/, a tiny cough like sound produce by the sudden release of a pulse of voiced or unvoiced air from the vocal folds.

Manner of articulation refers to how a sound is made, the way in which the air stream is obstructed, and how the air is released from the vocal tract.

Nasal: the sounds /m/, /n/, and /ɐ/are made by lowering the soft palate, blocking the oral airway, and directing sound through the nasal passages.

Glides: A few sounds are produced with smooth transition of articulator from one place to another. These are called glide sounds because you must move your articulators from one position to another during their production. For eg /w/ as in we /wi/, you must form your tongue and lips for the vowel ñooò /u/ and then shift or glide into the vowel ñeeò /i/, the distinctive sound of /w/ being made during the transition, during the shift.

Liquids: The English language has two liquid sounds, the/l/ and /r/, half consonant and half vowel, in which the voiced airstream flows around or over the elevated tongue.

Fricatives: These sounds are made by forcing the air through a narrow vocal tract creating a hissing or turbulence against the teeth and gum ridge /s/ and /z/ sibilant fricative sounds, for eg are made by forcing air through a narrow groove on the upper surface of the tongue; for the sh/Ű and zh/Ʂ / sibilants, or slightly wider groove must be employed.

Affricate: In the ch/ tŰ of choke /tŭk/ and the j/dɲ / of joke/dɲ ok/, a child must learn to link a plosive and fricative frequently. These consonant combinations are called affricates, and many children need help if they are to learn to combine their components

Plosives: In these one has to close lips tightly build up air pressure behind the seal, and then suddenly release the air with the popping sound where are the articulatory seals /t/ and /k/?

Voicing is the last dimension commonly used for classifying consonant sound .This refers to whether a consonant is accompanied by laryngeal tone.It depends on the state of the glottis ,as

- In voiced sounds, the vocal cords are vibrating.
- In voiceless sounds, the vocal cords are not vibrating.
- be held closer together, so that the air passing through them becomes turbulent. This quality of sound is

called breathiness. It is what is happening in aspiration and in the sound [h].

- be held together so tightly that no air can pass through at all, as in a glottal stop.

(By varying their tension and position, the vocal cords can also produce many other effects like breathy voicing, creaky voicing, and falsetto.)

What the vocal cords are doing is independent of what the higher parts of the vocal tract are doing. For any place of articulation and any degree of stricture, you can get two different sounds: voiced and voiceless. For example, [t] and [d] are formed identically in the mouth; the difference is that the vocal cords vibrate during a [d] but not during a [t]. (The obvious exception is the glottal place of articulation -- you can't vibrate your vocal cords while making a glottal stop.)

Chapter 4

Language and Its Disorders

Language

There are thousands of languages being spoken on our planet. These languages vary widely from each other but internally all languages share five important characteristics

- The use of symbols
- A limited set of different sound or phonemes.
- A vocabulary or lexicon of meaningful combination of these phonemes into units called morphemes.
- A set of rules for linking these units together.
- A set of rules for using language in a social context.

Every child must acquire this fivefold repertoire and do so at the same time he is learning hundreds of others new coordination, exploring the territory of his new world and testing the limit of his freedom.

Symbol

Language is comprised of a system of arbitrary symbols .A symbol is a surrogate it is something that stands for an object, an event, some feature of reality. The word cow for example, stands for the creature with four legs and hooves that gives milk. But the word cow is purely arbitrary it could just be word or any other combinations of letters or sounds. Words are simple metaphors, mental analog of reality. Apparently, the human nervous system is uniquely equipped biologically to process reality not directly on a concrete level, but through the use of symbols.In short, we bind experience by translating sensory events into symbols, order and meaning are created by the act of symbolization but it is important to remember that a word is not a thing or event. A sign is direct representation of an object or event and it has a single fix meaning regardless of the context.

There are four main components of language:

Phonology involves the rules about the structure and sequence of speech sounds.

Semantics consists of vocabulary and how concepts are expressed through words.

Grammar involves two parts. The first, syntax, is the rules in which words are arranged into sentences. The second, morphology, is the use of grammatical markers (indicating tense, active or passive voice etc.).

Pragmatics involves the rules for appropriate and effective communication. Pragmatics involves three skills:

- using language for greeting, demanding etc.
- changing language for talking differently depending on who it is you are talking to
- following rules such as turn taking, staying on topic

Each component has its own appropriate developmental periods.

Phonology

The term for a distinctive speech sound is phoneme and its concept is important in speech pathology. The phoneme /s/ is not really a single sound but a family of sound however if you listen carefully to the /s/ sound in the words ó*See'* and ó*Sue'* one will notice that the letter /s/ seams lower in pitch then the former. They are not the same sound but they are similar to be perceived as being identical. Moreover, there are no two words in English that have the difference meaning just because the two /s/ ,ôs differ in pitch .The difference between these two /s/ sounds make no difference in meaning. Variant members of a phonemic family are called allophones. In the development of speech, then the child must not only learn to produce all the standard phonemes of our language but also to recognize which allophones of those phonemes are acceptable and which are not. Distortion is the misarticulation of a standard sound in

which the latter is replaced by a sound not normally used in the language. The basic process in a childsô learning of discrimination and experimentation through matching his/her production with the models provided by other speakers, he comes to recognize that each of the phonemes consists of its own unique bundle of distinctive features. Any sound that does not have all of the set of distinctive feature possessed by a particular standard phoneme is perceived as being a different phoneme or an unacceptable distortion. For example the /s/ in ósueô and the /z/ in ózooô have several features in common since their manner and place of articulation are identical, but they are different phonemes because the /z/ is voiced and /s/ is not. Voicing, then, is one of the distinctive features of the /z/ in our language. The child gradually comes to recognize or has to be taught that the entire set of distinctive features belonging to a specific phoneme must be present if that sound is to be spoken correctly.

Morphology

It takes more than a collection of phonemes to make a language. Only when those phonemes are combined into meaningful units one has the vocabulary needed to communicate. Although there is great latitude, certain combination of phonemes is not permissible .For example a word cannot start with /ɹ/. Thus morphology is the study of the word structure, i.e. the linguistôs term for smallest meaningful unit of the language is morpheme. Words may consist of one or more morphemes. As baby is morpheme but the word babies consist of two morphemes that is baby & -ies. When morpheme can exist by itself similarly, and still be meaningful it is called free morpheme as in the above case baby is a free morpheme car , church, run etc are all free morphemes . Prefixes, suffixes and other such adders of meaning are called bound morphemes. They cannot exist alone, as in the above case ï óesô is a bound morpheme other such morphemes are ï ósô, -ed,ï óingô etc in case of words like cars, danced, running in English language.

Syntax

In linguistics, syntax is the study of principles and rules for constructing sentences in natural languages. While morphology looks at how the smallest linguistic unit morphemes are formed into making complete words, syntax looks at how those words are formed into making complete sentences. The speaker must also know how to combine these words into phrases and sentences. In the discipline of speech pathology we often meet children who have difficulty doing this. Perhaps they still speak in one word sentences at the age of four. Or perhaps they arrange the many words they do have in improper sequences. The person with dysphasia often has difficulties with syntax as well as with word finding. Trying to say ñI now have to go to the parkò one might struggle and gesture and begin and hesitate before uttering ñI é uhé parké .noé uhé goé .nowò. The child in learning a language must master certain rules in order to learn a language also learn some transformational rules. The language learner will have to know these rules even if he cannot verbalize them as not only the position of the word is changed but a new word may also have to be inserted or embedded in the new sentence structure. As our languages are governed by many rules some as examples are mentioned where (S) represents Subject, Verb (V), Object (DO), Adverb (Adv):

- S+V The dog + is running
- S+V+DO The man + saw + a cow
- S+V+DO+IDO The man + gave + a book + to John
- S+V+A The + book + fell + quietly

Languages vary in how they mark the different functions or rules.

Semantics

Meaning is the basic to the act of communication. An exchange of meaning between a speaker and his listener is

the whole point of talking. Parents correct their childrenôs utterances more often for content (meaning) than for form (syntax).

Child: Alaska is a warm state.

Parent: no, ñCold,ò John, very cold.

Child: Alaska is a cold state.

Semantics is the study of meaning and meaning is the relationship between words and the objects and events they represent. Some words such as ñpine treeò have an obvious referent i.e the object can be seen and touched say ótrunkô, óbranchô and óleafô but abstract words such as ófreedomô and óloveô or short connector words such as ñto ñ, ñofò or ñtheò derives meaning only from context .We find the denotative meanings of words ñwater ñ is a clear liquid composed of molecule of one part hydrogen and two partsof oxygen but an individual had a near drowning experience the morpheme ó waterò takes on every personal or connective meaning. Thus to say meaning of words largely depend on the context, situation or even tonal variation in which they are used and interpreted accordingly. Language is a dynamic tool and meanings are not found solely in dictionaries or even in the words themselves ï meaning is derived from how people respond to or use morphemes.

Pragmatics

The utterance of certain words that are combined in a grammatical sequence may constitute speech, but it does not necessarily constitute communication. Exchnage of purposeful messages back and forth between speaker and listener requires the observation of rules of appropriate communicative interactions. The term pragmatics refer to skills involved in the social use of language .The child is encouraged to say ñplease pass the beansò rather than ñgive me the beans ó But pragmatics is far more than the learning of good manners. It also involves knowing how to phrase a request, how to ask a question, how to start a conversation, or keep it going. The words we use and the manner in which we speak depends to a great extent on our purpose and the constraints of social situation. Talking is a sociopsychological event and there are distinct rules that govern how we use language within different social context as we offer congratulations at wedding and condolences at funeral and in elevators we remain quiet. Students talk differently in the dormitory then they do when conversing with their parents.

Prosody

Each language has its unique melody and patterns in addition to its other unique features and to speak their own language children must learn when and how to pause, how to pace an utterance, how to use pitch inflections, and how to stress and emphasize certain syllables. In linguistics, prosody is the rhythm, stress, and intonation of speech. Prosody may reflect various features of the speaker or the utterance: the emotional state of a speaker; whether an utterance is a statement, a question, or a command; whether the speaker is being ironic or sarcastic; emphasis, contrast, and focusi; or other elements of language that may not be encoded by grammar or choice of vocabulary. In terms of acoustics, the prosody of oral languages involves variation in syllable length, loudness, pitch, and the formant frequencies of speech sounds. In cued speech and sign languages, prosody involves the rhythm, length, and tension of gestures, along with mouthing and facial expressions. Prosody is absent in writing, which is one reason e-mail, for example, may be misunderstood. Orthographic conventions to mark or substitute for prosody include punctuation (commas, exclamation marks, question marks, scare quotes etc), typographic styling for emphasis (italic, bold, and underlined text), and emoticons.

The details of a language's prosody depend upon its phonology. The word dessert (eatable) has greater stress on the second syllable, compared to desert (as place), which has greater stress on the first but this is not differentiated

when the entire word is stressed by a child demanding "Give me dessert!". Vowels in many languages are likewise pronounced differently (typically less centrally) in a careful rhythm or when a word is emphasized, but not so much as to overlap with the formant structure of a different vowel. Both lexical and prosodic information are encoded in rhythm, loudness, pitch, and vowel formants.

Language analysis methods

Measuring phonology

Word Complexity Measure (WCM) is one of the quantitative methods to examine the phonological skills of a developing child. The WCM involves independent analyses of word productions of children acquiring English. Because the measure is designed for use with children who may have limited vocabularies and would be unable to provide a full set of responses to a single-word articulation test, the descriptions and examples below are based on words from conversational samples. It is possible, however, to use the WCM to analyze productions gathered with a single-word test. Each word in a sample is awarded a complexity ścoreô based on an approach that assesses different levels within the phonological system: word patterns, syllable structures, and sound classes. Higher scores indicate the presence of more complex/later acquired phonological parameters, with complexity determined by findings of investigations of early phonological acquisition (E.g. Stoel-Gammon, 1985; Robb and Bleile, 1994) and developmental norms (e.g. Prather, Hedrick, and Kern, 1975; Smit, Hand, Freilinger, Bernthal and Bird, 1990). It is well documented that certain sound classes and syllable structures tend to be established early in the speech of children learning English, namely the sound classes of stops, nasal, and glides, and the CV and CVCV syllable/word structures (Stoel-Gammon, 1985; 1987; Grunwell, 1987; Dyson, 1988). In the WCM analysis, phonological parameters that are expected to occur in the productions of a 24-month-old with typical speech and language development do not receive complexity points. The description below lists the eight ścomplexô parameters and provides examples of scoring.

Word patterns

(1) Productions with more than two syllables receive 1 point.

(2) Productions with stress on any syllable but the first receive 1 point.

Syllable structures

(1) Productions with a wordï final consonant receive 1 point.

(2) Productions with a consonant cluster (defined as a sequence of two or more consonants within a syllable) receive 1 point for each cluster.

Sound classes

(1) Productions with a velar consonant receive 1 point for each velar.

(2) Productions with a liquid, a syllabic liquid, or a rhotic vowel receive 1 point for each liquid, syllabic liquid, and rhotic vowel.

(3) Productions with a fricative or affricate receive 1 point for each fricative and affricate.

(4) Productions with a voiced fricative or affricate receive 1 point for each voiced fricative and affricate (in addition to the point received for #3).

Scoring word complexity with the Word Complexity Measure

The examples below, taken from child speech, illustrate the scoring procedures for theWCM:

(1) [beðbi] (target: baby) WCM ¼ 0 points

(2) [dædi] (target: daddy): WCM ¼ 0 points

(3) [bʊt] (target: bed): WCM ¼ 1 point (final consonant)

(4) [tʊʊn] (target: chicken): WCM ¼1 point (final consonant)

(5) [baʊ̆ʊ̆n] (target: crying): WCM ¼1 point (final consonant)

(6) [waɪ̯n] (target: around): WCM ¼1 point (final consonant)

(7) [bʊ̯k] (target: book): WCM ¼ 2 points (final consonant þ velar)

(8) [dɪ̆s] (target: this): WCM ¼ 2 points (final consonant þ fricative)

(9) [bˈʌɾɒfwaɪ̆] (target: butterfly):WCM¼3 points (> two syllablesþcluster þfricative)

(10) [ɪ̃win] (target: green): WCM ¼ 3 points (cluster þ final consonant þ velar)

Total complexity points: 14

Complexity points for the same words produced by an adult are as follows:

(1) [beɪ̆bi] (baby): WCM ¼ 0 points

(2) [dædi] (daddy): WCM ¼ 0 points

(3) [bʊ̀d] (bed): WCM ¼ 1 point (final consonant)

(4) [tʃʰɪ̀kɪ̆n] (chicken): WCM ¼ 3 points (final consonant þ affricate þ velar)

(5) [kraʊ̆ʊ̆ɪ̯] (crying): WCM ¼ 5 points (final consonant þ cluster þ liquid þ 2 velars)

(6) [ɒ̃raɪ̯nd] (around): WCM ¼4 points (non-initial stress þ cluster þ final consonant þ liquid)

(7) [bʊ̯k] (book): WCM ¼ 2 points (final consonant þ velar)

(8) [ðɪ̆s] (this): WCM ¼ 4 points (final consonant þ 2 fricatives þ voiced fricative)

(9) [bˈʌʊ̀flaɪ̆] (butterfly): WCM ¼ 5 points (> 2 syllables þ cluster þ fricative þ rhotic vowel þ liquid)

(10) [ɪ̃rin] (green): WCM ¼ 4 points (cluster þ final consonant þ velar þ liquid)

Total complexity points: 28.

As shown, the sample of 10 words produced by the child was awarded 14 points, yielding an average of 1.4 points per word. For the target words, the point total is 28, yielding an average complexity of 2.8.The ratio of child to adult complexity is .5, indicating that the complexity of the childôs productions is half the complexity of the target words. It should be noted that this small data set is presented to illustrate the WCM coding system; 10 words is too small to be a reliable indicator of overall word complexity.

Source: "The Word Complexity Measure: Description and application to developmental phonology and disorders" by CAROL STOEL-GAMMON, University of Washington, Seattle, WA, USA

Clinical Linguistics & Phonetics, April–May 2010; 24(4–5): 271–282

Mean length of utterance

Mean Length of Utterance (or MLU) is a measure of linguistic expressiveness in children. It is traditionally calculated by collecting 100 speech utterances spoken by a child and dividing the number of morphemes by the number of utterances.

$$\text{MLU} = \frac{\text{No. of morphemes}}{\text{No. of utterances}}$$

A higher MLU is considered to indicate a higher level of language proficiency.

T-units and C-units

Expressive language syntax of older children and adolescents can be measured in T-units (minimal terminal units), consisting of one main clause plus any attached or embedded subordinate clause or non clausal structure. Thus, the unit has shifted from the utterance to the sentence in its shortest allowable form. Any simple or complex sentence would be one T-unit, but a compound sentence would be two or more. For e.g. in the sentences ñI want ice creamò and ñI want the one that is hidden in the blue boxò each constitute one T-unit with varying numbers of words and

clauses.ò I want ice cream in the picture, and he wants a shakeò consists of two main clauses and thus two T-units.

The T-unit is more sensitive than MLU to the types of language differences seen after age 5, such as phrasal embedding and various types of subordinate clauses. Throughout the school years, a slow but regular increase occurs in sentence length in both oral and written contexts.

Childrenôs language can be described in words per T-unit, clauses per T-unit, and words per clause. A gradual and progressive increase in words and clauses per T-unit and in words per clause in spontaneous speech occurs with increased age throughout childhood and adolescence, although the values change only gradually during early school years (Klecan-Aker, 1985; Scott et all, 1992).

To calculate these values, the SLP divides the sample into sentences, each equaling one T-unit.the number of words and clauses then can be determined for each and divided by the number of T-units to calculate an average. The words per clause can be determined similarly.

A variance of T-units is the C-units. C-units are similar to T-units but also include incomplete sentences in answer to question.

The length increase in C-units is primarily through the increased use of low frequency structures. These include post-noun modifiers, such as apposition structures (Mary my instructor showed usé .) and prepositional phrases (the man in front isé ..), and elaborated verb tensing, such as modal auxiliaries (could have been), perfect aspect (had been working), and passive voice (The window was broken by a fly ball). Analysis of these structures might accompany calculation of C-unit values.

Examples of T and C units

Sentence Structure	Example	No. of T and C units
Simple-one clause	They watched the parade on TV	*1T-unit , 1C –unit*
Complex embedded clause	Washington has the horse I want	*1T-unit , 1C -unit*
Compound ï conjoining of 2 or more sentences	They went to the movie, but I stayed home. Mom went to work, I went to school, and my sister stayed home.	*2T-unit , 2C –unit* *3T-unit, 3 C -unit*
Partial sentences		
Elliptical answers	(Who went with you?) Marshon	*1C -unit*
Exclamations	Oh, wow!	*1C -unit*
Aphorisms	A penny saved	*1C -unit*

Assessing structural stage/ Complex sentence development

In Assigning structural stage, Miller (J.Miller, 1981) proposes three- tiered analysis that includes MLU (Mean Length of Utterance), percentage correct of Brownôs 14 morphemes and sentence analysis. These three measures enable the SLP to determine the stage of development and to describe the forms used. Although less precise than Developmental Sentence Scoring (DSS) (L.Lee, 1974). Assigning Structural Stage is more descriptive and prescriptive in nature. After determining the childôs stage of development, the SLP can target linguistic forms in the next stage (Prutting, 1979).

Analysis begins by collecting a language sample. The SLP collects 50-100 utterances or 15 minutes of conversation, whichever is larger, from the child for analysis. Unlike for DSS, these utterances do not have to be sentences. First, the SLP calculates MLU to determine the

stage of development and the approximate language age of the child.

After determining MLU, the SLP decides on the analysis method to follow. He /she may choose Assigning Structural Stage and /or Complex Sentence Development. If the MLU of the child is below 3.0, the SLP uses only Assigning Structural Stage. If the MLU is above 4.5, the SLP uses only Complex Sentence Development. For MLU of 3.0 to 4.5 the SLP uses both procedures.

In assigning Structural stage, the SLP calculates the percentage correct for Brownôs 14 morphemes. A minimum number of occurrences or possibilities of occurrence are needed before the SLP can decide on consistency or inconsistency of use or nonuse. The child should attempt a morpheme at least four times before a percentage correct figure is calculated.

The percentage correct value is determined by dividing the number of correct appearances by the total number of obligatory contexts. After calculating the percentage correct, the SLP again can attempt to describe the childôs stage of language development.

Next the SLP analyses each utterance within four possible categories of noun phrase, verb phrase, and negative and interrogative development. Utterances are divided into noun and verb phrases where applicable, and each phrase is assigned to the stage of development that best describes its structures. Negative or interrogative utterances are further assigned to stages representing their level of development.

The SLP should be familiar with the information Miller (1981) presents at each stage of development. Consider the childôs utterance, *want a big doggie*. The noun phrase *a big doggie* has been expanded by the addition of an article and an adjective to the noun. This noun phrase occurs in the object position of the sentence .Expansion of the noun phrase only in the object position is an example of stage II. Therefore, this sentence represents noun phrase development characteristic of stage II.The verb phrase is unelaborated, and no subject is present. This represents stage I development.

Complex sentence development is used similarly, but different samples and categories are used for analysis. Analysis is based on a 15 minute sample of the childôs communication, rather than on 50 utterances. For children with MLUs between 3.0 and 4.5, these samples can overlap. Five aspects of complex sentences are noted: percentage of both conjoined and embedded sentences within the sample, type of embedding, conjoining, conjunctions, and the number of different conjunctions. At each stage, development is described by the forms exhibited by 50-90 percent and by greater than 90 percent of the children.

All data from the two analysis methods ï Assigning Structural Stage and complex Sentence Development ï are combined to place the childôs language form within the stage or stages of development and to describe the childôs language form. The child functioning well below the age expectancy may need intervention.

Developmental sentence scoring

Developmental Sentence Scoring, the process discussed in Developmental Sentence analysis (L.Lee, 1974), is one of the most widely used and popular methods for assessing childrenôs syntactic and morphological development. Even so, DDS requires considerable study by the SLP to score language samples correctly.

To rate a sample of child language, the SLP collects 50 different consecutive sentences. No speaker uses full sentences all the time. Therefore utterances they do not qualify as sentences simply are omitted, and the remainder is collected until 50 consecutive sentences are amassed. DSS analysis should not be undertaken if less than 50 percent of the childôs utterances are sentences.

Scores from 1-6 are given according to the grammatical complexity at which a grammatical element is used.

Developmental sentence scoring form:

Score	Personal pronouns	Main verbs	negatives	Interrogative reversals	wh-queations	Total
Idonôt know what I like.	1,1,6	4,1		4		17
What you like?	1	1			2	4
Idonôt know	1	4		4		9
Iwant to go home	1	1	2			4
Whatôs that?		1			1	2
I cant go now.	1	4		4		9

Self-test

I. Choose the correct answer

1. The study of sounds and sound structure of a language is called
   a. Semantics
   b. phonology
   c. Syntax
   d. Semiotics
2. Allophones are
   a. Variation of same phone
   b. It is other types of production of a phone
   c. Both a and b are correct
   d. Only a is correct
3. Which of the following is incorrect regarding morphology
   a. They are study of structure of words
   b. Morphemes are affixes of words
   c. Like allophone there is no term as allomorph
   d. There is relation between morpheme and syntax

4. ñSubmarine was flying high in the airò, this sentence is
   a. Semantically correct but syntactically incorrect
   b. Syntactically correct but semantically incorrect
   c. Morphological error is present
   d. None of the above
5. Which of the following is a pragmatic skills
   a. Turn taking
   b. Suprasegmentals
   c. Using ñingò at the end of the verb to make it present continuous
   d. Both b and c

III. True or False

1	Prosody is a suprasegmantal aspect of speech	T	F
2	The symbols used in language are arbitrary	T	F
3	a and a: are going to give different meaning, here the vowel length is the phoneme.	T	F
4	Pooja drove the car. She parked that in a garageò, understanding that the word ñsheò refers to pooja, takes the listeners phonetic knowledge to understand it.	T	F
5	Dressing for an eventò is pragmatic skill.	T	F

Keys

I. a, c, c, b, a

II. T, T, T, F, T

Additional sources for reading

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Manual – 2

Introduction to Linguistics

Kuppuraj S

Foreword

All India Institute of Speech and Hearing (AIISH) established in 1965 is a leading institute serving persons with communication disorders in South-East Asia. The institute offers grants from AIISH Research Fund for conducting research in the field of Audiology, Speech-Language Pathology, Speech-Language Sciences, and other related disciplines.

The current project titled ñDevelopment and Evaluation of Curriculum for Speech Language Transcriptionò (ARF 3.46) was envisaged keeping in view the lack of manpower to transcribe existing speech language samples. Dr.K.S.Prema, Prof. of Language Pathology, Dept. of Speech-Language Sciences, AIISH, Mysore, initiated the idea to increase manpower generation in speech language transcription, by proposing a project to develop course books with manuals and CDôs as a part of training kit to train eligible transcribers. Transcription of spoken language samples would serve as a huge database of many speech language disorders that helps in clinical as well as research activity. The principal investigator has taken inputs from an expertise phonetician, Prof.Peri Baskara Rao, Tokyo University of Foreign studies, wherever necessary.

Introduction to General Linguistics is one of the course books written by Mr. Kuppuraj S., Project Officer, of the current ARF project. The book contains two chapters. The first chapter on General Linguistics describes Language planning, Phonetics, Phonology, Morphology, Syntax, Semantics, and Pragmatics. The second chapter on applications of Linguistics focuses on Scope of linguistics and its relevance to speech-language pathology and audiology, macro linguistics and its applications in clinical and research work.

Prof. K. S. Prema

Dept of Speech Language Pathology
Principal Investigator of the project

Chapter I
General Linguistics

Chapter 2
Applications of field of Linguistics

Chapter I

General Linguistics

I.1. Introduction

Linguistics is the scientific study of language. There are different disciplines within the field of Linguistics to study the structure of language, its internal organization, language learning by children, 2nd language learning by children and adults, the influence of one language upon society and that of society upon language, the influence of one language upon another, and the way in which language undergoes change.

A glimpse of linguist work is given below,

Linguists claim that there is internal representation of native language in every ones brain, and every incoming words are judged against this internal representation. This claim is based upon the fact that the speakers are able to produce and understand , fluently any number of novel but grammatically correct sentences in that language, and further, they are also able to decide as to whether a given sentence , even if they had never heard it before , is grammatically correct or not in that language.

I.2. Why study linguistics

It is an enquiry regarding extremely fascinating natural phenomena, and like any other scientific enquiry, it needs no justification as such. It is the nature of man to be curious about the things and events that exist or take place around him, and while trying to satisfy his curiosity, he has been able to establish several specialized fields of learning. We can regard linguistics as one of these specialized fields. There are several applications the knowledge of linguistics has in our day today life. Some of well-known applications of this royal subject are teaching of foreign language, providing therapies to speech disorders and language planning.

I.3.Teaching a foreign language

The necessity to provide instructions in different languages arose only recently as a result of more and more adult persons desiring to learn foreign languages for various purpose such as visiting foreign countries , developing business contacts , understanding foreign countries and so on. The teacher's good explicit grammatical knowledge of the language concerned is very essential for preparing such helpful language teaching courses, or for providing instructions based on such courses. Thus, the explicit knowledge the linguistics gives is an essential criteria for teaching a second language to adult learners.

I.4. Language pathology

An explicit knowledge of the nature of the language, its grammar and its functioning would be extremely helpful in providing adequate therapies to individuals who are suffering from various kinds of language disorders. For example, brain damage due to an accident or stroke can lead to partial or complete loss of the ability to use language. When the loss is partial, the aspect of language that gets affected might differ from one person to another. In some patients, there may be complete loss of the ability to speak, but the ability to understand, read and also to write might be retained. In others, the speech might be dissociated from meaning: the patient could speak fluently, but the words that he produces would be strung together in strange ways.

Speech disorders also affect the control of grammar in various ways. Some may have difficulty in recalling verbs but not nouns or adjectives; some can refer to objects only indirectly through complicated descriptions; they would be unable to recall the

correct noun for referring to them. It has been found that in many of these instances the defect can be very much reduced through therapeutic intervention. But a fairly good explicit knowledge of grammar of the concerned language is necessary not only for providing such a therapeutic intervention, but also for establishing the exact type of grammatical defect that has affected the speech of a particular individual.

In the case of learning mother tongue also, child may fail to acquire fluency in some aspects of language. A complete assessment with explicit grammatical knowledge could expose those deficient aspects and proper intervention can be made.

I.5. Language planning

Every living language undergoes changes automatically with reference to time. There is no language in the world that remains same over generation. Apart from such natural occurring changes, a given community can also consciously introduce modifications into its language or dialect in a purposeful fashion and also carry them out more speedily, in which case we can regard the changes as resulting from language planning. These planned changes can also be of two distinct types, namely modifications which affect the structure of a given language or dialect (called corpus changes) and modifications which affect the position of the whole language or dialect in specific situations or contexts like education, administration, mass media and so on (called status changes).The point to be noted here is that the question as to whether a particular change that is being planned, either of the corpus or of the status , is going to be beneficial or not to the community as a whole, and further, whether it is going to be successful or not in its implementation, or rather how a given community can implement it successfully, can be answered only on the basis of a detailed study of the nature of language and its functioning in general and of the language and dialects under consideration in particular. There are several parameters that need to be looked in to in this connection, and many of these require a special knowledge of language, that is linguistics.

Linguistics or scientific study of language has five divisions under which it is operating its understanding of feature of normal language. The operating systems of language are phonology, morphology, semantics, syntax and pragmatics. This chapter will give somewhat in-depth idea on phonetics and phonology, since this is considered more significant compared to other systems of language, for transcription.

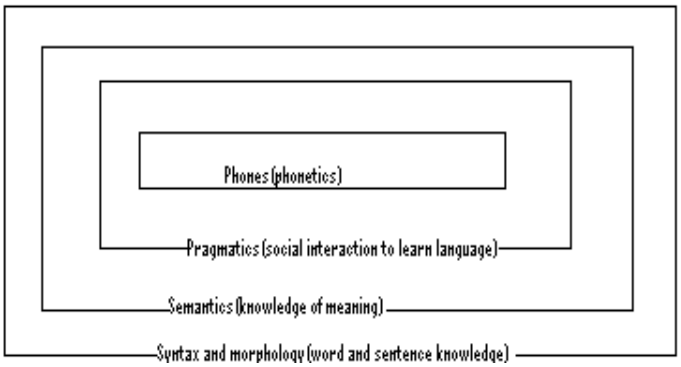

Figure.1 The order of language organization in children.

The figure shows the relationship among all the components of normal language and its serial of development in normal children. The sounds produced by children before he began to know its meaning are just called phones. However, in linguistic terms the study of any sounds regardless of language is called phonetics. The child develops social interaction with mother and other even before he begins to understand speech. The linguistic study of these behaviors in both adults and children is

called pragmatics. Once the interaction begun, he develops the knowledge about meaning of words. The scientific study of how meaning of language is comprehended is semantics in linguistic terms. Then the child is aware of the sentence structures and word structures he/she uses. In linguistic terms, this enquiry is termed as syntax and morphology respectively. This chapter will give an impression to non-linguist regarding each of components of language and its relevance to speech language science.

I.6. Phonetics

"Heavenly labials in a world of gutturals" Wallace Stevens

Humans are anatomically specialized to speak, and our species spoke long before we began to write language down. Because language and speech are so closely related, the beginning of study of language is by examining the inventory and structure of the sounds of language. This branch of linguistics is called phonetics.

Phone: just any speech sound, resistant to language (related word-phonetics)

Phoneme: sound that can be replaced by another sound in case the meaning of the word is to be changed. (Language specific)

Human languages display a wide variety of sounds, called phones or speech sounds. There are great many numbers of speech sounds, but not an infinite numbers of them. Human vocal tract (region from voice box to lips) can produce many sounds, among which few sounds may not bear any meaning in particular language. Certain sounds that human are capable of producing with the vocal tract do not occur in speech- the sounds made by inhaling through the corner of the mouth, for instance. But few exotic seeming sounds do occur in human languages, such as the clicking made by drawing the tongue hard away from the sides of the upper molar or the sound made by constricting the sides of the throat while breathing out. The class of possible speech sounds is not only finite, it is universal. A portion of the total set will be found in inventory of any human language. Any human, child or adult, can learn how to pronounce these sounds, regardless of racial or cultural background. The concern of phonetician, who is actually a linguist, is to unravel the physics behind every speech sound of a language. He is also interested in production variation of a particular speech sound across cultures and language. Simply, the phonetician works beyond borders.

Phoneticians study the speech sounds scientifically (phonetically) in two ways. Knowing the way they study would help the readers of this course to establish some basic knowledge of speech sounds and its manifestations. Phoneticians study speech sounds from physiological point of view (articulatory phonetics), physics point of view (acoustic point of view).

I.7. Studying speech sounds physiologically

Speech sounds (applies to sounds those are produced by pulmonic air) are produced by co ordinate effort from lungs, larynx, oral cavity. The lung serves as the source of air and produces the initial push by constriction of lung muscles. The generated air passes through the larynx (voice box) and the air stream gets the shape of air puffs. These air puffs eventually make their way out through oral cavity. When they make way out, due to the shape of oral cavity (the resonant characteristics) they are heard as different sounds.

Speech sounds conventionally are divided into consonants and vowels.

Consonants

Consonants are the group of speech sounds produced with little to absolutely complete obstruction of air stream anywhere in the vocal tract.

Consonants are classified based on following features,

The manner of articulation

The method that the consonant is articulated, such as nasal, stop, or approximant.

The place of articulation

Place where in the vocal tract the articulators of the consonant act, such as bilabial, alveolar, or velar.

The phonation method

Whether or not the vocal cords are vibrating during articulation of a consonant. When the vocal cords are vibrating, the consonant is voiced; when they are not, it's voiceless.

Aspiration is also a feature of phonation.

The airstream mechanism

The nature of air source during articulation. Most languages have exclusively pulmonic egressive consonants, but ejectives, clicks, and implosives are non pulmonic and use different mechanisms.

By changing the speed of the column of air, the size and shape of the resonating chamber, and the kind of vibration introduced into the air stream, we produce the phonetic differences that constitute the sounds of speech

Starting from lips until glottis there are several places in the vocal tract from where speech sounds can originate.

Places of Articulation

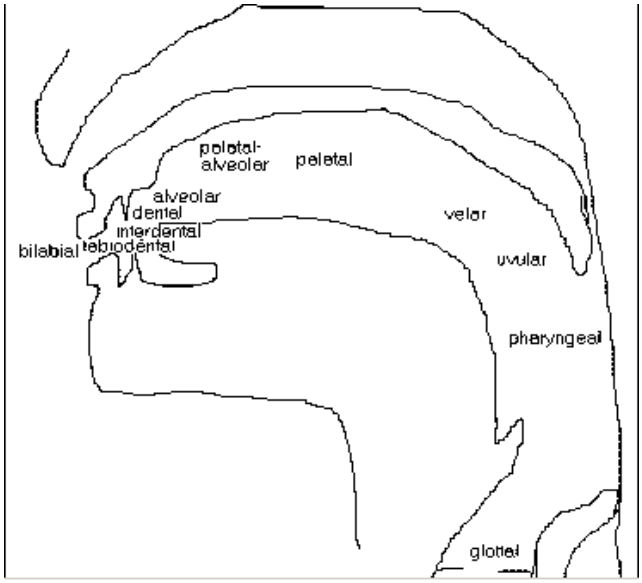

Figure.2. Places of articulation in vocal tract.

Source:

http://www-01.sil.org/computing/ipahelp/ipaplace2.htm

Place of Articulation

Place of articulation refers to the location where the constriction or obstruction of the vocal tract occurs, as well as to the active or passive articulator(s) involved in the production of the consonant.

Bilabial

As the name implies, a bi-labial articulation is carried out by using both lips as active articulators. For English, more or less the only bilabially produced (and distinctive) consonants are the plosives /p/, /b/ & /m/.

Labio-Dental

In a labio-dental articulation, the lower lip and the upper teeth act together in producing the sound. In fairly standard English, only the two fricatives /f/ & /v/ belong to this category. One

further sound – that is still considered non-standard, but seems to become more frequent for some younger speakers – is a labio-dental approximant [ʋ]. It represents a realization of /ɹ/ which some people regard as one of the features of a new emerging 'standard' called Estuary English, although it may also occur as a type of speech defect or in the speech of very young children, who have not acquired the standard pronunciation of /ɹ/ yet.

Dental

Dental articulation in English is exemplified by the two fricatives /θ/ & /ð/, which often represent a problem for foreign learners. This, however, may at least partially be because some older textbooks used to describe them as *inter-dental*, a pronunciation that is not only unrealistic, but also relatively difficult to achieve for the voiced variant.

Alveolar

The alveolar ridge, situated just above the upper teeth, is a highly popular place in terms of the production of English consonants. No less than 7 sounds are produced there, ranging from the plosives /t/ & /d/, including the nasal /n/, via the fricatives /s/ & /z/, to the two approximants /ɹ/ & /l/.

Palato-Alveolar

Sounds produced somewhere between the alveolar ridge and the hard palate are referred to a palato- or sometimes also post-alveolar. They include the two fricatives /ʃ/ & /ʒ/, as well as the two affricates /tʃ/ & /dʒ/.

Palatal

The only English 'consonant' that is produced with a palatal articulation is /j/.

Velar

A velar place of articulation is limited to the two plosives /k/ & /g/, and their nasal counterpart /ŋ/.

Glottal

Out of the two glottal sounds of English, we have already encountered one, namely the fricative /h/.The other glottal consonant is the plosive /ʔ/, also known as glottal stop.

Manner of Articulation

The process by which the moving column of air is shaped is called the manner of articulation. For English, these are:

Stops: /p, t, k, b, d, g/

Fricatives: /f, v, θ, ð, s, z, ʃ, ʒ, h/

Affricates: / tʃ, dʒ/

Nasals: /m, n, ŋ/ (sometimes called "nasal stops")

Liquids: /l, r/

Glides: /w, y, hw/

The Stops

Stops occur when the air stream stops completely for an instant before it exits the vocal tract. Voiceless stops in English are the /p/ in 'pour' and 'slap,' the /t/ in 'time' and 'adept,' and the /k/ in 'cold' and 'poke.' Voiced stops are the /b/ in 'bow' and 'crab,' the /d/ in 'dock' and 'blood,' and the /g/ in 'game' and 'bag.'

The Fricatives

Fricatives occur when the air stream is audibly disrupted but not stopped completely. Voiced fricatives are the /v/ in 'very' and 'shove,' the /ð/ in 'thy' and 'bathe,' the /z/ in 'zoo' and 'wise,' and the /ʒ/ in 'measure' and 'Zha Zha.' Voiceless fricatives are the /f/ in 'fool' and 'laugh,' the /θ/ in 'thigh' and 'bath,' the /ʃ/ in 'shock' and 'nation,' the /s/ in 'soup' and 'miss,' and the /h/ in 'hope' and 'ahead.'

The Affricates

An affricate starts out as a stop, but ends up as a fricative. There are two affricates in English, both of which are palatal. Therefore, we do not need to mention place of articulation to describe affricates. The voiceless affricate is the /ʧ/ in 'lunch' and

'chapter.' The voiced affricate is the /ʤ/in 'germ,' 'journal' and 'wedge.'

The Nasals

Nasals occur when velum is lowered allowing the air stream to pass through the nasal cavity instead of the mouth. The air stream is stopped in the oral cavity, so sometimes nasals are called "nasal stops." We will just call them "nasals." Nasals are the /m/ in 'mind' and 'sum,' the /n/ in 'now' and 'sign,' and the /ŋ/ in 'sing,' 'longer' and 'bank'.

The Liquids

The "lateral" liquid, /l/, is pronounced with the restriction in the alveolar region at the beginning of syllables, as in 'low' and 'syllable,' but in the velar region at the ends of syllables, as in 'call,' 'halter,' and 'syllable.' It is called "lateral" because air blows around the sides of the tongue The "central" liquid is the /r/ in 'rough' and 'chore.'

This also has various pronunciations. It is called "central" because air flows over the center of the tongue. So the terms "central" and "lateral" replace the place of articulation in descriptions of the liquids.

The Glides

Glides occur when the air stream is unobstructed, producing an articulation that is vowel-like, but moves quickly to another articulation making it a consonant. Sometimes glides are described as semivowels. The glides in English include the /w/ in 'witch' and 'away,' and the /y/ in 'yes' and 'yoyo.' Some English speakers have a voiceless alveolar glide. This is transcribed /hw/ and occurs in 'whether,' 'which,' and why.

Two further symbols for approximants that are not usually included in the consonant table are /w/ for the voiced labial-velar and [ɫ] and the velarised variant of the alveolar lateral /l/

The Consonants of English								
	Bilabial	Labiodental	Dental	Alveolar	Palatoalveolar	Palatal	Velar	Glottal
Plosive	p b			t d			k g	ʔ
Nasal	m			n			ŋ	
Fricative		f V	θ ð	s z	ʃ ʒ			h
Approximant				ɹ		j		
Lateral Approximant				l				

Figure.3.The IPA chart for consonants.

Vowels

Vowels are group of speech sounds those are produced with no or little obstruction to the flowing air through vocal tract, but a complete closure of articulators never occur in vowel production. All the vowels have glottal vibration(voiced) during its production. Vowels can be classified physiologically based on tongue height, tongue backness, lip rounding, tense, and lax.

Tongue Height

The first aspect of vowel classification that you will be introduced to is that of tongue height. Vowels are classified in terms of how much space there is between the tongue and the roof of the mouth, which is determined by the height of the tongue. There are three primary height distinctions among vowels: high, low, and mid. In English, examples of high vowels are [i], [ɪ], [u], [ʊ]. These are vowels with a relatively narrow space between the tongue and the roof of the mouth. Examples of low vowels are [æ], [a]. These are vowels with a relatively wide space between the tongue and the roof of the mouth. Examples of mid vowels are [e], [ɛ], [o], [ɔ]. These are vowels whose tongue positions are roughly between the high and low vowels.

These classifications are quite relative, as different languages have different canonical tongue heights for different classifications.

As illustration of tongue height, observe the following diagrams for the vowels [i], [ɛ], & [æ].

As you can see from the diagrams, the tongue height of the high vowel [i] is much higher than that for the low vowel [æ], while the tongue height for the mid vowel [ɛ] lies somewhere in between the two.

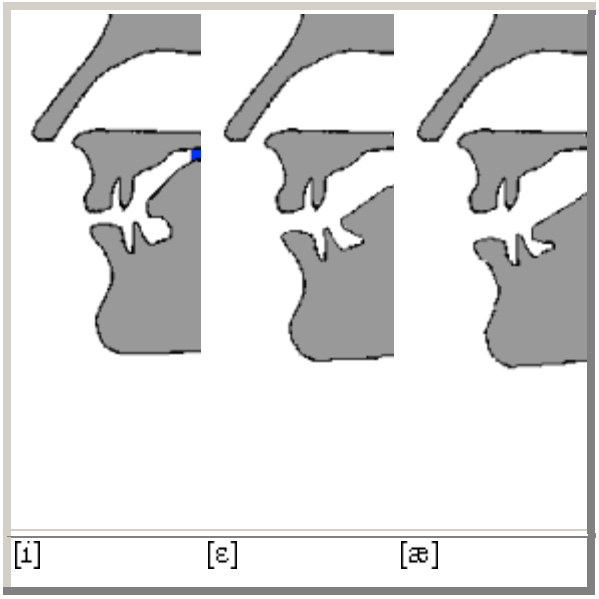

Figure.4 Tongue height for low and high vowels.

Source: http://www.singwise.com/cgi-bin/main.pl?section=articles&doc=VowelsFormantsAndModifications

Tongue Backness

The second aspect of vowel classification that you will be introduced to is that of tongue backness. Vowels are classified in terms of how far the raised body of the tongue is from the back of the mouth, which is called the backness of the tongue.

There are three primary height distinctions among vowels: front, back, and central.

In English, examples of front vowels are [i] , [ɪ], [e], [ɛ], & [æ]. These vowels are articulated relatively forward in the mouth. Examples of back vowels are [u], [ʊ], [o], & [ɔ]. These vowels are articulated relatively far back in the mouth.. Examples of central vowels are [a] & [ə]. These are vowels whose tongue positions are roughly between the front and back vowels.

These classifications, like the tongue heights, are relative, as different languages have

different canonical tongue backnesses for different classifications.

As illustration of tongue backness, observe the following diagrams for the vowels [i] & [u].

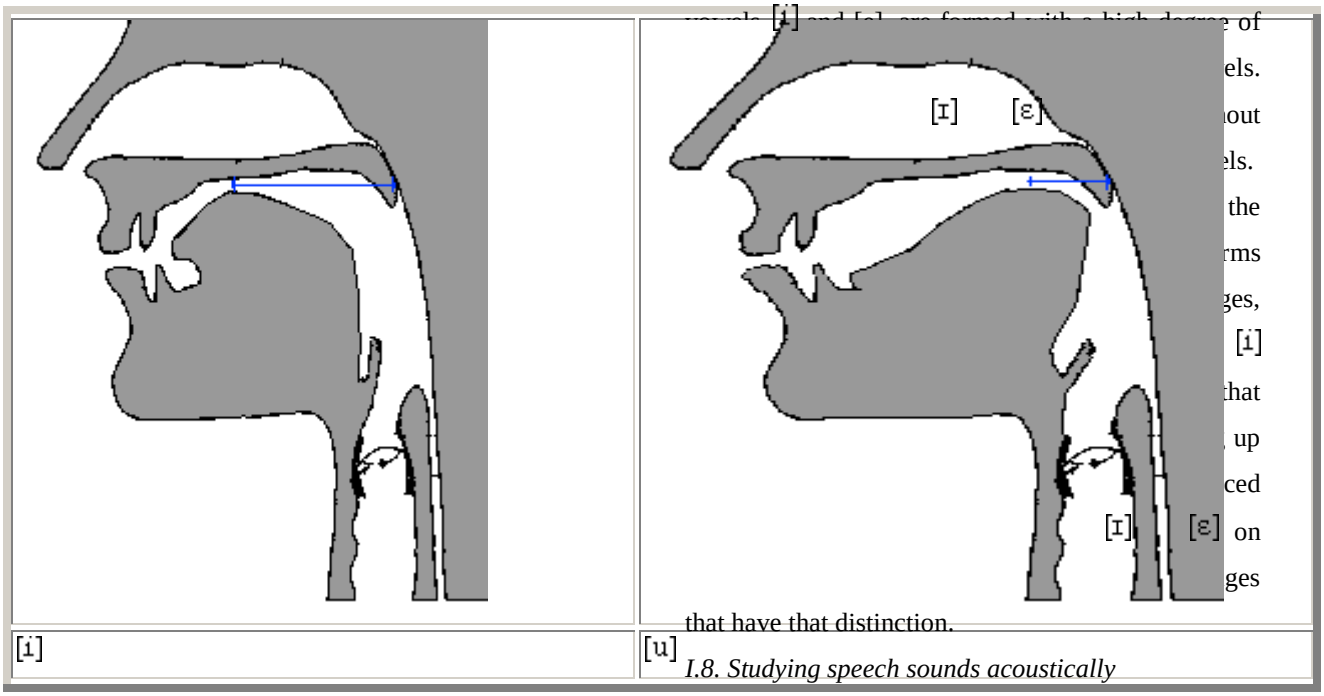

Figure.5. Tongue backwardness for back and front vowels. *(Source same as Fig 4)*

As you can see from the diagrams, the articulation of the front vowel [i] is much farther forward than that for the back vowel [u].

In the next section, you will be introduced to the classification of vowels in terms of lip rounding.

Lip Rounding

Another aspect of vowel classification is the presence or absence of lip rounding. Some vowels, such as the vowels [u] and [o], are formed with a high degree of lip rounding. Such vowels are called rounded vowels. Some vowels, such as [i] and [ɛ], are formed without such rounding, and are called unrounded vowels.

Tense vs. Lax

Another aspect of vowel classification is commonly characterized in terms of the tenseness or laxness of the articulators. Some vowels, such as the vowels [i] and [ɑ] are formed with a high degree of

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that have that distinction.

I.8. Studying speech sounds acoustically

Acoustic phonetics uses the spectrographic information to study the speech sounds, unlike the articulatory phonetics, where the physiological information of sound production was used to study speech sounds. Spectrogram is the representation of speech in visible form, rightly called the visible speech. Talented acousticians are reported to have read speech by just seeing the speech spectrograms. It is generally the combination of both acoustic and articulatory nature of speech that results in effective understanding of speech sounds.

Creating spectrogram

Every sound will have frequency and its intensity, speech signal is no different. When the speech is recorded using microphone, the signal is picked up by the microphone with respect to the intensity and frequency of the speech signal over

time. Simply, the microphone's diaphragm gets displaced based on the intensity of the signal to which the microphone is exposed. The frequency of the incoming signal keeps varying in time scale, and it is recorded by the number of diaphragm vibrations per second. The microphone sends the signal to the software designed to display the spectrogram and the recording process is complete.

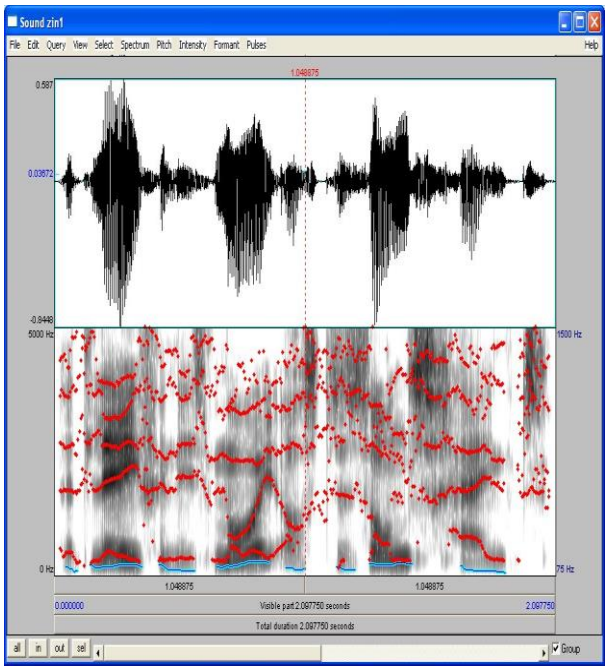

Fig.6. Spectrogram.

Three important aspects of spectrogram are intensity, frequency, and time. Frequency of the signal is represented in y axis. The higher you see the shade in y axis the higher the frequency of the incoming signal. The intensity of the incoming signal is displayed as the thickness of shading, or vertical lines in the spectrogram. The time is in x axis the scale is in milliseconds usually.

Acoustic phonetics of speech sounds

As we discussed about the articulatory aspects of speech sounds, the acoustic aspects is mainly discussed with reference to the spectrographic dimension of speech sound.

Vowels

Before moving into explaining vowel nature in spectrogram, the concept of formants should be introduced. When a phonation is made air puffs is made to travel along the oral cavity. Oral cavity has tongue in to which would change the resonance frequency of the oral cavity by modifying its position itself. The lips and jaws too are contributing to the change in volume and shape of the oral tract. The change in volume of several interconnected cavity result in boosting of particular frequency. Those boosted frequencies are called formants. There is theoretically infinite number of formants, though only first three formants hold significance in acoustic studies.

Vowels are displayed clearly in the spectrogram by short, thick vertical striations at the base of the spectrogram. Formant frequency is the major distinctive feature of any two vowels in spectrogram. For example the distance between two formants seen in spectrogram is considered to be the perceptual cue to differentiate any two vowels. Of course there are many more secondary cues those can assist to differentiate between two vowels spectrographically.

Consonants

Unlike vowels consonants have several levels of transparency when it comes to revealing itself in spectrogram.

Voiced VS voiceless

Voiced consonants show similar vertical striations to vowels on a spectrogram, although they are often weaker and possibly also shorter, and therefore show up a little less clearly.

Manner of Articulation

The term manner of articulation refers to the way in which the obstruction inside the oral cavity is made. According to this, we can establish a few different classes of consonants that each show characteristic features which usually make them identifiable on a spectrogram with a bit of practice.

Plosives

Plosives are shown by complete absence of energy in spectrogram of the duration during which the articulators are obstructed, followed by the abrupt release of articulators shown by sudden raise in energy as burst, followed by a vowel if there exists one.

Fricatives

Amongst the consonants, the fricatives are the easiest to identify visually, partly due to their relative length compared to plosives, and partly due to the fact that they exhibit strong 'random' noise patterns in specific frequency areas, depending on their place of articulation. These noise patterns are due to the turbulent nature of fricatives and their relative length to their sustainability. Fricatives are identified as high frequency random noise in the spectrogram.

Affricates

Stop plus friction together forms affrication. Therefore, there will be a abrupt release in energy shown, followed by friction (high frequency noise) in spectrogram.

Nasals

Nasal sounds are produced by opening the way for speech sounds through nasal cavity .Now the relative cavity (nasal and oral) volume is increased since nasal cavity also adds up to the usual oral sounds. Since the cavity is big the resonance seen to diminish and there appears an anti resonance (cancelling out of resonance between oral and nasal region) in spectrogram (a diminished low frequency energy). Though they appear higher than the voice bars these are indication of voicing, which appear very low in the spectrogram.

Glides

The glides /j/ & /w/ are similar to /i:/ and /u:/ respectively, but more difficult to detect any steady state patterns due to the abrupt movements. However, for the vowels you do not see an abrupt change in transition.

Aspiration quality

Aspirations are a low frequency noise in the spectrogram usually follows a stop consonant's burst. The striations occur neither low on voice bar region, nor high on fricative region.

Phonetic transcription

One of the significant contributions to the phonetics by phoneticians is invention of International Phonetic Alphabets. These symbols are used to transcribe speech as it is said, irrespective of language. Simply, if you know the symbols and its sound counterpart, it is not difficult to write down any speech sound that the human vocal tract possibly can produce. Only experts in IPA symbols and transcription can of course read the written material using IPA. The knowledge on transcription seems inevitable in the field of phonetics, where they are indulged in colleting field data of different language that they have never even heard of. There are several other applications of this fine phonetic transcription, and you are expected to be aware of it once the completion of the complete course.

I.9. Phonology

Phonology is the enquiry on the function and patterning of sounds in particular language.

When we speak about linguistic knowledge, we often mean subconscious or implicit knowledge that speakers of a language cannot readily put into words. English speakers know that forms like *slish* and *screk* are acceptable in his language, while forms like *pnap* and *sdip* is not acceptable in his language. The knowledge of acceptable sound patterns in a particular language is called phonotactics and studying about phonotactic rule of a language is called phonology.

Phonologists attempt to make clear and explicit statements about the sound patterns of individual languages in order to discover something about the linguistic knowledge that people must have in order to use these patterns. Even more broadly, the study of phonology attempts to discover general principles that underlie the patterning of sounds in human language.

Phonology deals with

The distinctive feature of a sound from another

E.g. how the /b/ is different from /p/? The sole distinctive feature between two is presence of voice in /b/ and absence of voice in /p/. So only one feature is differing among two.

Phoneme knowledge of a language

E.g. how many phonemes are there in a language? What is the pattern in which they can occur with other phonemes?

Syllable structure

Knowledge of existing patterns of syllable structures of a language. For e.g. certain language have only CV type of syllable. English is expected to have CCV pattern. Likewise, every language is expected to differ in pattern of syllable structure.

Phonological process: Knowledge of phonology also enables one to understand the unusual production of phonological patterns seen in developing child. The child may use gag for bag, which is assimilation process.

Phonological knowledge and its applications: The nature of a language and its phonological structure is defined based on phonological analysis on that particular language.

If the speech pathologist is to check a person's ability to perform on non word tasks he must know the phonological agility of a language to design non words on that particular language.

E.g. *plasky* cannot become non-word in Tamil where as *manage* becomes a non-word in this language since it follows the phonotatics of Tamil.

The knowledge of phonology also helps SLP to design treatment strategies for phonological process (the mispronunciations those normally happen in child's developmental stages) those are persisting even after due time for its extinction.

The knowledge of phonology also help in designing minimal pairs for articulation therapy, where in the pairs are differing by only one feature of one sound in a word. E.g. mat –pat are the minimal pairs in which /m/ is differing from /p/ in one feature only called absence of nasalization

I.10 Morphology

There are two basic types of words in human language- simple and complex. Simple words are those cannot be broken down in to smaller meaningful units while complex words can be analyzed into constituent parts, each of which expresses some identifiable meaning. The word houses, for example, are made up of the form house and the plural marker –s, neither of which can be divided into smaller morphemes. While many English words consist of only one morpheme, others contain two, three or more.

Types of morphemes: Morphemes can be of three types such as free morpheme, root morpheme, and bound morpheme.

Root morpheme: Any word that cannot be divided further in to simple meaningful units, is supposed to remain with root morpheme.

Bound morpheme

These are the bounding letters after a root morpheme, usually a tense marker and inflection or derivation markers.

E.g of root Vs bound morpheme.

Bags: bag+s

Bag= root word or morpheme

S= the bound morpheme.

Free morpheme

These are root words with invisible morpheme. For e.g. the plural marker for sheep is also sheep, where the marker's' is hiding inside the root word and not spelled or spoken out.

Morphological rules of language help one to form a new word in that language. For example, acquisition of morphological rules called adding '*ed'* at the end of verbs, denoting past tense, helps the child to use '*ed*' whenever he/she has to use past tense.

Morphological knowledge and applications

Like the knowledge of rules to combine sound patterns (phonology) could help the linguist for documentation, the knowledge of words can be formed (morphology) in a language, thus help to document all the rules based on which simple words can be combined.

The knowledge of morphology of particular language assists the researchers to study the developing pattern of morphological knowledge in particular language.

The acquisition of morphological knowledge by a child is very crucial for speech language therapists since if the child has potential to learn the rules of morphology of his language he would learn lot of words sporadically. Therefore, this would be important goal in SLPs program.

Morphology of every language has to be documented and changes in its use need to be traced, since it varies hugely from one to another language. For e.g. the morphology of Chinese is very different from rest of morphological structure of language of world.

I.11. Syntax

The study of sentence structure of a language. Language is highly structured system of communication. Utterances are not formed by randomly combining linguistic elements. Rather, as in words consist of phonological units called syllables, which intern are made up of segments and features. Syntax is the system of rules and categories tat allows words to be combined o form sentences. To make it simple syntax deals with grammatical structure of a language. It is crucial to note the name of legendary linguist Noam Chomsky, and his significant contribution to explanation of syntax. He introduced the concept called generative grammar, to explain grammar at level of brain. He postulated that every human brain, no matter which language he belongs to, has innate neural loop to learn any grammatical environment he is exposed to. The language to which he is exposed o determines his/ her language structure. For e.g. the child born in china and South India would have same brain structure , tough it learns different syntactical structure since they are exposed to different language structures, and it had agility to learn any language structure it is exposed to. The person who deals with structure of a language is called syntactician. The interest of syntactician is to examine how words are formed in

to sentences is a particular language, and how this formation rules vary across different language. Modern research in syntax attempts to describe languages in terms of such rules. Many professionals in this discipline attempt to find general rules that apply to all natural languages. Phrase-structure rules are a way to describe a given language's syntax. They are used to break a natural language sentence down into its constituent parts (also known as syntactic categories) namely phrasal categories and lexical categories (aka parts of speech). Phrasal categories include the noun phrase, verb phrase, and prepositional phrase; lexical categories include noun, verb, adjective, adverb, and many others. Phrase structure rules were commonly used in transformational grammar (TGG), although they were not an invention of TGG; rather, early TGG's added to phrase structure rules (the most obvious example being *transformations*; see the page transformational grammar for an overview of the development of TGG.) A grammar that uses phrase structure rules is called a phrase structure grammar - except in computer science, where it is known as just a grammar, usually context-free.

I.12. Semantics

Up to this point in the book, the emphasis has been on the form of utterances –their sound pattern, morphological structure, and syntactic composition. In order for language to fulfill its communicative message, it should have content. This section is concerned with semantics, the study of meaning in human language. The basic repository of meaning within the grammar is the lexicon, which provides the information about the meaning of individual words relevant to the interpretation of sentences. Semantics does not deal with single word level, called lexicon alone. The study of semantics is concerned with a broad range of phenomena including the nature of meaning, the role of syntactic structure in the interpretation of sentences, and the effect of pragmatics and speaker beliefs on the understanding of utterances. The human brain is proven to have anatomical structures where in word meaning is stores and retrieved. Like the semantic web system that assists the computer to search an item intelligently, human brain adapts certain mechanism that helps to search certain words in lexicon (group of words). Researchers in semantics are interested in exploring the way these items are related to one another and the way they are accessed. Three major area of interest of researchers in semantics in recent times are lexical & conceptual semantics, lexical semantics, and computational semantics.

I.13. Pragmatics

Semantics is the study of direct, literal, purely linguistic meaning of a sentence. However, in many cases when people actually use sentences, in natural, normal, real life situations, they mean more than when they actually say. Further, listeners understand this additional meaning despite the fact that there may be little or nothing present in the sentence itself to convey it.

Look at the following sentence,

Can you take out the garbage?

Linguistically, this is a question, specifically yes/no question formed by the syntactic rules. If you analyze it using semantic and syntactic knowledge that would stop us at the point of linguistics alone. However, the extra linguistic message inside the sentence will go unnoticed. In the real word, the sentence does give an imperative meaning and not the question. The knowledge to interpret the request in the speaker's utterance is type of pragmatic skill.

Unlike other four aspects like semantics, syntax, phonology, pragmatics deals with extra linguistic aspects of communication, in other words the usage of language.

Neurolinguistically also, the brain hemisphere responsible for extra linguistics is different from brain area responsible for linguistics processing.

Knowledge of pragmatics and its application:

The population that is suspected to have pragmatic disorder occupies considerable amount in total communication disorder population. They show normal processing (comprehension) of semantics, syntax and phonology. However, their pragmatic skills like ability to initiate conversation or maintain it are hampered. Some of pragmatic skills used in day today conversation are topic initiation, topic maintenance, discourse content maintenance, narration, and turn taking etc. Patients who show these deficits might have pragmatic disorders. Thus, the attention of behavioral therapists is sought.

Chapter II

Applications of field of Linguistics

Sections on chapter one grossly discussed the linguistics and its domains. This chapter is dedicated to the disciplines those are benefiting from linguistics and vice versa. First part of the chapter will highlight on camouflaged linguistics in speech language pathology, and the later part will give idea to the readers about macro linguistics, that is linguistics beyond borders.

II.1. Linguistics and language pathology

The discipline of Speech-Language Pathology is a specialized field that often adopts principles from various other disciplines including linguistics. To date, the two disciplines appear to have remained wide apart and hence, there is a need to bridge the gaps in the knowledge source so that both the fields mutually benefit from each other and that research and clinical practice in Speech-Language Pathology becomes more efficient and effective.

While the linguistic science has for long been the domain of linguists where language is studied along with its nuances in varied cultural and linguistic diversity, bi/multilingualism and second language teaching/learning situations, the speech-language pathologists are making attempts to draw principles from linguistics to stretch its application to an array of communication disorders. However, in India, application of linguistic science to population with communication disorders has yet to become robust. The quantum of training imparted to the speech-language pathologists in the application of linguistic principles to clinical speech and language samples has yet to inculcate sufficient confidence among the professionals. This generally prevents them to adopt the right methods and approaches in the assessment and rehabilitation of speech-language disorders in children and adults. Yet, the relevance of clinical linguistics to speech-language pathology cannot be undermined. While the discipline of Speech-Language Pathology addresses the issues related to language acquisition and its disorders - in both children and adults, the linguistic science focuses towards the study of 'normal' language. Given the tangential interests of the two disciplines, mutual application of principles of one to the other (Linguistics to Speech-Language Pathology and vice versa) is very crucial. Therefore, there is an urgent need to strengthen the professional skills in this direction.

Historically, the contribution of Roman Jakobson's theory of phonemic disintegration (1956) to Aphasia could be considered as the beginning of the convergence of the two disciplines. His valuable contribution to draw Aphasiology away from the mere surface description of symptoms and to provide the first interpretations of aphasics' language disturbances in a linguistically motivated way is a significant milestone in the history of Linguistics. The seeds of application of linguistic principles to clinical needs were thus sown which gradually led to a spate of studies (Crystal, 1972 and others). Consequently, the pioneering work of David Crystal and his influence led to the emergence of 'Clinical Linguistics' as a coherent sub-discipline of Applied Linguistics during 70's and 80's in the UK (Perkins and Howard, 1995). Clinical Linguistics broadly leads to an understanding of application of theoretical and descriptive linguistics to Speech-Language Pathology. Crystal defines it as the application of theories, methods and findings of Linguistics

(including Phonetics[1]) to the study of '*those situations where language handicaps are diagnosed and treated'* (Ball, 1988a). In other words, clinical linguistics is seen primarily as an applied discipline, to clinical practice in which the analysis of language disability from a linguistic perspective often raises issues of a theoretical nature.

II.2. Scope of linguistics

General linguistics covers a wide range of topics and its boundaries are difficult to define. The linguistics itself can be seen as having its micro component and its macro component. Micro components are within a certain definable distance, where as macro components are beyond certain well defined limits and it enables a linguist to go beyond, just linguistics and merge with other disciplines, for collateral benefits.

Micro linguistics: The application of linguistic knowledge with in a language, called micro linguistics. Phonology and syntax falls under micro linguistics.

Macro linguistics: The application of linguistic principal beyond a language boundary, to different societies (Socio linguistics), Neurology (Neurolinguistics) and Psychology (Psycholinguistics) is called macro linguistics. The diffusion of linguistic fragrance beyond its micro limits, has led to better understanding of language with reference to other disciplines.

II.3. Macro linguistics and its applications

Psycholinguistics or psychology of language is the study of the psychological and neurobiological factors that enable humans to acquire, use, and understand language. Initial forays into psycholinguistics were largely philosophical ventures, due mainly to a lack of cohesive data on how the human brain functioned. Modern research makes use of biology, neuroscience, cognitive science, and information theory to study how the brain processes language. There are a number of sub disciplines; for example, as non-invasive techniques for studying the neurological workings of the brain become more and more widespread, Neurolinguistics has become a field in its own right.

Psycholinguistics covers the cognitive processes that make it possible to generate a grammatical and meaningful sentence out of vocabulary and grammatical structures, as well as the processes that make it possible to understand utterances, words, text, etc. Developmental psycholinguistics studies children's ability to learn language.

Psycholinguistics is interdisciplinary in nature and is studied by people in a variety of fields, such as psychology, cognitive science, and linguistics. Several subdivisions within psycholinguistics are based on the components that make up human language.

In linguistics and cognitive science, cognitive linguistics (CL) refers to the school of linguistics that understands language creation, learning, and usage as best explained by reference to human cognition in general. It is characterized by adherence to three central positions. First, it denies that there is an autonomous linguistic faculty in the mind; second, it understands grammar in terms of conceptualization; and third, it claims that knowledge of language arises out of language use.

Cognitive linguists deny that the mind has any module for language-acquisition that is unique and

[1] The issue of whether clinical phonetics should be regarded as a sub discipline of clinical linguistics or as a separate discipline in its own right is discussed in Ball (1988a).

autonomous. This stands in contrast to the work done in the field of generative grammar. Although cognitive linguists do not necessarily deny that part of the human linguistic ability is innate, they deny that it is separate from the rest of cognition. Thus, they argue that knowledge of linguistic phenomena -- i.e., phonemes, morphemes, and syntax -- is essentially conceptual in nature. Moreover, they argue that the storage and retrieval of linguistic data is not significantly different from the storage and retrieval of other knowledge and use of language in understanding employs similar cognitive abilities as used in other non-linguistic tasks.

Departing from the tradition of truth-conditional semantics, cognitive linguists view meaning in terms of conceptualization. Instead of viewing meaning in terms of models of the world, they view it in terms of mental spaces.

Finally, cognitive linguistics argues that language is both embodied and situated in a specific environment. This can be considered a moderate offshoot of the Sapir-Whorf hypothesis, in that language and cognition mutually influence one another, and are both embedded in the experiences and environments of its users.

Computational linguistics is an interdisciplinary field dealing with the statistical and/or rule-based modeling of natural language from a computational perspective. This modeling is not limited to any particular field of linguistics. Traditionally, computational linguistics was usually performed by computer scientists who had specialized in the application of computers to the processing of a natural language. Recent research has shown that human language is much more complex than previously thought, so computational linguists often work as members of interdisciplinary teams, including linguists (specifically trained in linguistics), language experts (persons with some level of ability in the languages relevant to a given project), and computer scientists. In general computational linguistics draws upon the involvement of linguists, computer scientists, experts in artificial intelligence, cognitive psychologists, mathematicians, and logicians, amongst others.

Neurolinguistics is the science concerned with the human brain mechanisms underlying the comprehension, production and abstract knowledge of language, be it spoken, signed or written. As an interdisciplinary endeavor, this field straddles the borders between linguistics, cognitive science, and neurobiology and computer science, among others. Researchers are drawn to the field from a variety of backgrounds, bringing along a variety of experimental techniques as well as widely varying theoretical perspectives. Neurolinguistics has highlighted the special role of that part of the human brain known as Broca's area in crucial aspects of human language, namely syntax: the component of language that involves recursion.

Neurolinguistics studies the relation of language and communication to different aspects of brain function, i.e. it tries to explore how the brain understands and produces language and communication. This involves attempting to combine theory from urology/neurophysiology (how the brain is structured and how it functions) with linguistic theory (how language is structured and how it functions).

1. "human language or communication (speech, hearing, reading, writing, or non-verbal modalities) related to any aspect of the brain or brain function" (Brain and Language: "Description")

2. The common problem area of relating aspects of language or communication to brain function in this dynamic formulation, is stated as a common question by Luria in "Basic problems in Neurolinguistics":
3. "what are the real processes of formation of verbal communication and its comprehension, and what are the components of these processes and the conditions under which they take place" (Luria, 1976)
4. Language is all around us; from the instructions, newspapers, books and web pages we read to the lectures we listen to and the conversations we have. There are so many parts working together in a language that most of us take for granted. The knowledge of linguistics program, you can discover everything you never knew about language and how all the different aspects work together. Linguistics ahs contributed to several other disciplines by lending its principles at micro and macro levels. One such contribution is International Phonetic Alphabet. It is a notational system, which is used to pen down any sound that could possibly be produced by human vocal tract. The readers are requested to study chapter I in depth in order to understand basic concepts of phonetics. However, the information regarding transcription is out of scope of any of the chapters in the book.

Self test

I. Choose the correct answer.

1. I *cut* the grass last night. In this sentence, the word *cut* is a
   a. Root morpheme
   b. Bound morpheme
   c. Free morpheme
   d. Branch morpheme

2. The study of sentence structures are called
   a. Semiotics
   b. Syntax
   c. Semantics
   d. Morphology

3. Which of the following comes first in child developmental period
   a. Pragmatics
   b. Semantics
   c. Syntax
   d. Phonology

4. Fricatives are
   a. Produced with burst
   b. Produced with slight constriction between two articulators
   c. Produced with aspiration
   d. Produced through nasal cavity

5. The collateral branch of linguistics that deals with studying language from persons behaviors is termed
   a. Computational linguistics
   b. Neuro linguistics
   c. Socio linguistics
   d. Psycholinguistics

6. Which of the following is micro linguistics
   a. Phonetic studies
   b. Syntax
   c. Neurolinguistics
   d. Sociolinguistics

7. Formants are
   a. Fundamental frequencies
   b. Voiced sounds
   c. Multiplication of fundamental frequencies
   d. None of the above

8. When the person with language difficulties utters a English sentence as '*mama was absent tomorrow'*, from linguistic point of view he is having
   a. Semantic deficit
   b. Phonological deficit
   c. Pragmatic deficit
   d. Syntactical deficit

9. Rolling stone gather no mass, if the person is having difficulty in comprehending the abstractness behind this metaphor, how will you define his lesion site , from psycholinguistic point of view
   a. Lesion in broca's area
   b. Lesion in cerebellum
   c. Lesion in right hemisphere
   d. Lesion in left hemisphere.

10. In anatomy of vocal tract which of the following is incorrect
   a. Velum is posterior to hard palate
   b. Pharynx is lower than larynx
   c. Alveolar region is posterior to lips
   d. Tongue can change its dimension flexibly.

II. Match the following

1. Phone	a)grammar
2. Phonetics	b)computational linguistics
3. Bound morpheme-	c) any sound
4. Syntax	d) morphemic knowledge
5. /i/	e) Neurolinguistics
6. Macro linguistics	f) physical aspects of speech sound
7. Language processing in brain	g) ing
8. Word building	h)high vowel

Key

I c, b, c, b, d, a, a, d, c, b

II

1	c
2	f
3	g
4	a
5	h
6	e
7	b
8	d

Further Reading

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Manual – 3

Speech Language Transcription System and its Methods

Archana Sastikar

Foreword

All India Institute of Speech and Hearing (AIISH) is a leading institute serving individuals with communication disorders in south Asia, established on 1965.The institute appreciates research in the field of Speech language sciences, speech language pathology and Audiology using the fund called AIISH Research Fund(ARF), raised from the beneficiary population of the institution.

Several research projects is being proposed in order to avail the fund for research purpose, one of them has resulted in development of this practical work book. Lack of manpower to transcribe existing speech language samples created a need to develop a kit to train eligible transcribers. Transcription of spoken language samples would serve as a huge data base of many speech language disorders that helps in clinical as well as research activity. Dr.K.S.Prema, Prof. of Language Pathology, Dept. of Speech-Language Sciences, AIISH, Mysore, initiated the idea to increase manpower generation in speech language transcription, by proposing a project through which curriculum was developed to train volunteers to transcribe speech language transcription. The name of the project is ñDevelopment and Evaluation of Curriculum for Speech Language Transcriptionò, numbered 3.46. The principal investigator has taken all possible inputs from an expertise phonetician, Prof.Peri Baskara Rao, Tokyo University of Foreign studies, wherever necessary.

Introduction to methods of speech-language transcription systems is one of the theory course books for the curriculum The current manuscript is written by Dr.Archana Jaolekar Lecturer, Dr.M.V Shetty College of Speech and Hearing, Mangalore, who is well versed in linguistics and speech language transcriptions. The book contains six chapters, each one of them focusing on different aspects of communication and its disorders. The author has given gross introduction about International Phonetic Alphabets, Use of IPA transcription in the initial portions of her work. In the further sections she has spoken about variables to be considered while transcribing and things to be considered while transcribing. The author has given detailed information about how to perform speech language transcription in the final section of the course book

Prof.K.S.Prema

Dept of Speech Language pathology
Principal Investigator of the project

Contents

Introduction

There are different languages all over the world especially in India as it is multilingual and thus different languages to communicate. Some of these languages may or may not have script for example Tulu spoken in Karnataka and each language the written form and spoken form may be different i.e. one letter stands for many sounds/ different sounds/ combination of sounds in different words and conversely.

For Example in English: /u/ - cut, put, rude, minute, busy, university

/k/ - kit, rock, c - cut, cc- acclaim,

Therefore, there is mismatch between spelling and sound. Thus, there are always problems in how to pronounce it? How to spell new words? Apart from this not everyone knows each and every language, so learning and communication across the countries is difficult. To overcome these problems a need was been felt to evolve an alphabet in which words of any language could be written unambiguously. One such alphabet which is used very extensively by the phoneticians all over the world is IPA, devised by the International Phonetic Association. It is claimed to have symbols to represent all the sounds that exist in the languages of the world. Therefore can be used to transcribe words of any language i.e. can note them/ write them down more or less as one pronounces them.

International Phonetic Alphabets are primarily based on the Roman alphabets, but since 26 letters of the Roman alphabets are grossly inadequate to represent all sounds that exist in all languages of the world, some additional symbols have been devised by modification of the existing symbols of the alphabet and some other symbols have been borrowed from the Greek alphabet.

Example: /ʌ/ and /ɛ / are modified form of v & e Roman alphabets.

Furthermore, in some cases, the small and capital letters of Roman alphabet have been employed to stand for different sounds.

Example: a and A

r and R

Finally, there is also a set of diacritics/ modifiers which are used to modify the sounds.

Example: diacritics put below the symbol of an alveolar plosive indicate that plosive in question is dental, not alveolar.

What is the International Phonetic Alphabet (IPA)?

International Phonetic Alphabet (IPA) is a set of symbols to represent different sounds, the way they are produced across the globe.

The aim of the ***International Phonetic Association (IPA)*** is to promote the study of the science of phonetics and the various practical applications of that science. For both these, it is desirable to have a consistent way of representing the sounds of language in written form. From its foundation in 1886 the association has been concerned to develop a set of symbols which would be convenient to use, but comprehensive enough to cope with the wide variety of sounds found in the languages of the world and to encourage the use of this notation as widely as possible among those concerned with language. The system is generally known as the International Phonetic Alphabet (IPA). Both the Association and its Alphabet are widely referred to by the abbreviation of IPA, and here the alphabet will generally be abbreviated to IPA. The IPA is based o the Roman alphabet which has the advantage of beginning widely familiar, but also includes letters and additional symbols from a variety of other sources. These additions are necessary because of the variety of sounds in a language is much greater than the number of the letters in the Roman

alphabet. The use of sequences of phonetic symbols to represent speech is known as a transcription.

Phonetics, like any science, develops over time. New facts emerge, new theories are created and new solutions to old problems are invented. The notational system of any science reflects facts and theories, and so it is natural that from time to time the alphabet should be modified to accommodate innovations. The development of the IPA has, throughout the history of the association, been guided by a set of 'principles'.

The Extensions to the IPA for the transcription of disordered speech and voice quality (Ext IPA) were approved at the 1989 IPA Congress in Kiel (Duckworth et al. 1990, Ball 1991). A transcription system for disordered speech needs to provide sufficient diversity of symbols and diacritics to account for the majority of observed phonetic variants. Creation of standard new symbols and diacritics for every observed variant is ultimately counterproductive. However, these are the only atypical speech production phenomena that may, in the long run, be worthy of inclusion in a revised Ext IPA, and thus further suggestions from clinicians and phoneticians are expected.

I. Brief History of IPA

The name of the association is international phonetic association and was inaugurated in 1886, under the title of the phonetic teachers' association, by a small group of language teachers in France who had found phonetic theory and phonetic transcription of value in connection with their work, and who wished to popularize the methods that they had found so useful. The idea of establishing a phonetic alphabet is to be applicable to all languages across the globe and was first put forward by Otto Jespersen in a letter to Paul Passy, in June 1886. Other members took up this idea with enthusiasm, and after consultations, extending over more than two years the first version of the International Phonetic Alphabet was drawn up. it was published in ðə fonetik tîtcər, August, 1888, together with a set of principles regarding its construction and its use.

There should be a separate letter for each distinctive sound; that is, for each sound which, being used instead of another, in the same language, can change the meaning of a word so it should be represented by different sound.

- When any sound is found in several languages, the same sign should be used in all. This applies also to very similar shades of sound.
- The alphabet should consist as much as possible of the ordinary letters of the Roman alphabet, as few new letters as possible being used.
- In assigning values to the Roman letter, International usage should decide.
- The new letters should be suggestive of the sounds they represent, by their resemblance to the old ones.
- Diacritic marks should be avoided, as it would be tiring for the eyes and troublesome to write.

The original International Phonetic Alphabet of 1888 contained quite a number of the special letters used today, but it was imperfect in various respects. The council has accordingly, since 1889, worked unremittingly to remedy defects, improving upon signs, which proved unsatisfactory, and extending the alphabet to provide for languages, which had not received consideration at the outset. The result is that we now have a system which, though doubtless capable of still further improvement, is a very effective instrument for transcription on International lines, and one which can be used both in "broad" and in "narrow" forms for the phonetic representation of all the principal languages of the world, and as a basis for orthographic reform for all languages needing it.

It is satisfactory to find that the work of the Association, extending as it does over the years, has met with considerable success. Its alphabet is now used for indicating pronunciation not only in the Association's official publications, but also in numerous dictionaries, textbooks by authors unconnected with the association in many

countries. The Association considers that by encouraging the use of internationally recognized phonetic symbols for all languages, its work contributes seriously to the creation and maintenance of cordial relations between peoples of different countries.

In addition, the aim of the Association is the advancement of the study of the phonetics in all its aspects, but principally

1) To make the acquisition of living languages simpler and more accurate, and

2) To achieve the scientific and practical representation of languages as yet unwritten or for which there exist is only a defective method of representation.

The association considers that in pursuing this aim it makes a genuine contribution to friendly relations between peoples of different countries.

Further improvements

The Association Phonetique International does not claim that its alphabet is either complete or perfect. The forms of some letters may be susceptible of improvement, and it may be necessary to invent new signs either for newly discovered sounds or to distinguish shades of sound hitherto left undistinguished. Members of the association make suggestions for improvement from time to time, and none are definitely adopted without careful consideration and vote of a majority of the council.

Since its creation, the IPA has undergone a number of revisions. First International Phonetic Alphabets were given in 1888. After major revisions and expansions in 1900 and 1932, the IPA remained unchanged until the IPA Kiel Convention in 1989 i.e. modified in 1989 in which the non pulmonic consonants were included in the same consonant table as ejective stops and implosives, not separately. However, vowels, suprasegmentals, other symbols and diacritics were given separately. In this version Extensions to the IPA was introduced to transcribe the disordered speech. Thus, Extensions of the alphabet are relatively recent; "Extensions to the IPA" was created in 1990 and officially adopted by the International Clinical Phonetics and Linguistics Association in 1994.

Who can use IPA?

Many professionals benefit from IPA transcription. For example, language teachers, phoneticians, speech language pathologists (SLP), communication scientists, singers, actors, lexicographers, translators, linguists and also persons with disability. However, in order to carry out transcription, an individual requires theoretical and practical experience of phonetics, for phonetic transcription. In order to describe the speech sounds one has to depend on how the sounds in the words are produced since the way words are spelled as conventional spellings represent only partially the pronunciation of words. Hence, a phonetic alphabet devised by (International phonetics Association (IPA) in 1988 is used, in which each phonetic symbol stands for one and only one sound.

The IPA can be used for many purposes. It can be used as a way to represent pronunciation of a word or a longer sequence, unambiguously in a dictionary. Phonetic transcription makes it possible for dictionaries to provide pronunciations of individual words and for language teachers to teach them. Therefore, it is possible to learn new language with its pronunciation. Language documentation by recording a given language in a linguistic fieldwork. . It helps to account for the changes over a period of time.

Useful to compare normal with the disordered one and also to check the phonetic development for phoneticians and Speech Language Pathologist for clinical purposes. As well as

- To form the basis of writing system for a language
- To annotate acoustic and other displays in the analysis of speech.
- To teach a foreign or 2nd language to adults, To compare sound systems of different languages. For researches – when a researcher in

linguistics/speech language pathology writes for the first time the text of a speech in a language, unknown to him, s/he can do so with the help of phonetic transcription. At times , a researcher may have to deal with a language so far unwritten. In all such cases, phonetic transcription proves immensely useful. Therefore language is not a barrier for use of IPA.

- Any assessment of a patient's speech (as opposed to language) requires an analysis of both the phonetics and phonology. A phonetic analysis alone will not tell us how a patient uses the sounds described, but an adequate phonological analysis cannot be constructed without detailed phonetic data to work on. In addition, this is possible only by using IPA. So, helps in diagnostic and therapeutic of Speech and Language disorders i.e. variety of errors can be considered by using extensions to the IPA as it has variety of symbols to represent different colors of speech such as intonation, stress, voice quality etc. For example, while dealing dysarthic speech, phonological disorders, child phonology etc. it is helpful to use these symbols for accuracy.
- Classical singers - IPA has widespread use among classical singers for preparation, especially among English-speaking singers who rarely sing in their native language. Opera librettos are authoritatively transcribed in IPA, such as Nico Castel's volumes and Timothy Cheek's book singing in Czech. Opera singers' ability to read IPA was recently used by the Visual Thesaurus, which employed several opera singers "to make recordings for the 150,000 words and phrases in VT's lexical database.

*Braille version of the International Phonetic Alphabet can be used for persons with visual impairment.IPA aims to fulfill this role.

There are some variables which have to be considered while transcribing a speech sample as based on one's requirement and accordingly the results will change. Traditional important variables to consider are sampling mode (continuous speech; articulation tests), agreement type (intra-judge; inter-judge), and level of transcription (broad or narrow).

Sampling Mode

Recording: Phonetic transcription can be either live or from recorded material. In clinical situations it is often difficult, to undertake any kind of live transcription while at the same time keeping the full attention and confidence of the patient. Also live transcriptions often miss much information, and will interfere with clinician – patient interaction. It is natural, therefore, that the bulk of clinical phonetic transcription is done from audio or video recorded material. Therefore, perceptual analysis of transcribed speech sounds is the recommended way of capturing patient's speech output for analysis i.e..

Transcribing from tape recorded speech (good quality) has its limitations too. It does not always allow one to make a complete record of the patient's utterances. Various behaviors can be lost through this medium. For example, the difference between a labiodentals and bilabial fricative is difficult to hear on tape alone, even more so that difference between a dental and an inter dental fricative. Also lost is the common habit of 'silent articulations', where a patient may prepare to make, for example, a target bilabial articulation, but then proceed to a following vowel without pronouncing the consonant. An alternative, which avoids some of the problems of the audio tape, is to use video (preferably as well as high quality audio tape). The video play back will supply much of the visual cues not picked up on audio.

There will be the added difficulty that if transcribers are working from an old tape with considerable background noise (including someone knocking on the clinic room door

when the recording was made). Therefore the transcriptions could mislead to something else as they will not get the minor aspects of the disordered speech. So considerable noise free sample should be recorded to avoid errors and to increase accuracy of the transcription which is required while transcribing disordered speech samples.

Types of IPA transcription

Continuous speech sample, responses on tests of articulation, narrations and standard text / passages may be collected for speech language transcription. A transcription that represents only the phonemes of a language is called phonemic transcription or broad transcription, which disregards distinctions but is in less detail (a coarser transcriptions), whereas the one that shows allophonic distinctions explicitly is called allophonic transcription or narrow transcription or phonetic transcription which is in greater detail, precise and does not loose information. IPA transcriptions are denoted within two principal types of brackets. Notation used for phonemic/ Broad transcription is /slashes/. And notation used for allophonic / Narrow transcription is [square brackets].

For example, Phonemic transcription OR broad transcription is denoted as /pIn/ and / spin/ whereas Allophonic transcription OR narrow transcription: [phIn] and [spIn]Shriberg & Lof (1991) concluded that for certain clinical and research tasks in communicative disorders, broad transcription appears to be reliable, whereas narrow transcription may be unreliable. Thus, reliability of broad and narrow transcription is in question as the kind of information will change to its extent based on the type of transcription used. Thus one has to decide which type of transcription is required for the specified samples and based on for what purpose it is used for Therefore, , the type of transcription should be taken into account when one considers the transcribed sample for either clinical or research purpose.

Example 1:

	Broad transcription	Narrow transcription
Shop	/ʃɔp/	[ʃɔp]
See	/si:/	[ʕi:]
Ship	/ʃIp/	[ʃIp]
Sip	/sIp/	[ʕIp]
Cushion	/kuʃən/	[kuʃən]
Shoe	/ʃu:/	[ʃu:]
Seat	/si:t/	[ʕi:t]
Wash	/wɔʃ/	[wɔʃ]
Yes	/jes/	[jeʕ]
Kiss	/kIs/	[kIʕ]
Messy	/ˈmesi/	[ˈmeʕi]

In example 1, by using, broad transcription speaker has lost the contrast between target/s/ and /ʃ/. Thus, type of transcription is an important aspect, because if transcription type is not specified upfront the interpreter may get into confusions.

Example 2:

	Broad transcription	Narrow transcription
Pin	/pIn/	[p^{h}In]
Bin	/pIn/	[pIn]
Cot	/kɔ:t/	[k^{h}ɔ:t]
Got	/kɔ:t/	[kɔ:t]
Ten	/ten/	[t^{h}en]
Den	/ten/	[ten]
Pea	/pi:/	[p^{h}i:]
Bee	/pi: /	[pi:]

There is a collapse of phonological contrast: specifically the contrast between voiced and voiceless plosives in word – initial position. This clearly leads to homonymic clashes between *pin – bin* and *cot- got* respectively. Therefore, according to broad transcription this voicing feature contrast is lost. On the other hand, according to narrow transcription,

there is not, in fact, a loss of contrast between initial voiced and voiceless plosives. Target voiceless plosives are realized without vocal fold vibration (voice), but with aspiration on release (as are the adult target forms), but also without any vocal fold vibration. This difference distinguishes them from the target form (Ball & Kent, 1997).

Insufficiently narrow phonetic description can often underestimate a disordered client's phonological ability; it can also sometimes overestimate it. This can occur when the transcribers are limited to the symbols used in a phonemic transcription of English or when the expected sound or both influence them.

Example 3:

	Broad transcription	Narrow transcription
Mats	/mæts/	[mætʂ]
Top	/tsɔ:p/	[tʂɔ:p]
Match	/mætʃ/	[mætʂ]
Chop	/tʃɔ:p/	[tʂɔ:p]
Pat	/pæts/	[pætʂ]
Tin	/tsIn/	[tʂIn]
Patch	/pætʃ/	[pætʂ]
Chin	/tʃIn/	[tʂIn]

In the example 3, the broad transcription suggests that the speaker maintains a contrast between target /t/ and /tʃ/. The affricate appears to be pronounced as the adult target, with the plosive realized as an affricative at the alveolar place of articulation. However, if we examine the narrow transcription, in this instance a restriction to the symbols used in transcription led to an overestimation of the person's ability. In narrow transcription, person uses a retroflex affricate for both target /t/ and /tʃ/. So contrast of phonemes has lost in detailed transcription.

However, good, accurate phonetic transcription is often difficult. There are several studies showing that the more detailed transcribers attempt to be, the more inter- and intra-transcriber inaccuracies tend to occur (Shriberg & Lof, 1991). In recent times, transcribers have more frequency integrated instrumental and impressionistic aspects of the description of both normal and disordered speech in view of the availability and simplicity of phonetic instrumentation,. (Ball & Kent, 1997).

Ball, Muller, Rutter (2009) emphasize the iimportance of narrow phonetic transcription in transcribing a variety of speech disorders by such as clients with severe disfluency, progressive hearing loss, dysarthria idiosyncratic velar articulations, and progressive speech degeneration. The use of the extended International Phonetic Alphabet (IPA) for the transcription of disordered speech and the Voice Quality Symbols (VoQS) system for transcribing voice quality is introduced and illustrated in the following sections.

These findings emphasize the need for training in narrow transcription

Reliability of transcription

Ball & Rahilly (2002) discussed the difference between broad and narrow phonetic transcription, the importance of narrow transcription with disordered speech and the measurement of transcriber reliability. Miller (1995) reported that perceptual analysis of speech errors can be used for a differential diagnosis of acquired motor speech disorders as in spastic dysarthric; speech dyspraxic and phonemic paraphasic without dysphasia. A variety of analyses failed to establish any consistently reliable differential diagnostic pointers. Use of narrow phonetic transcription of single-word naming and repetition responses, and a comprehensive taxonomy of error types revealed a clear pattern for differential diagnosis.

The process of speech transcription is time consuming. .When transcription of one sample is done by two different transcribers; there might be differences between because of their knowledge about that particular language, perceptual abilities, knowledge about symbols, and/or influence of their native language. Therefore, the two transcriptions are

generally compared for intertranscriber agreement. In this sort of procedure one normally looks to agreement rates of 90% or better. In the case of disagreements, the participants will check to make sure that they are not simply due to disagreements as to what a symbol stands for, or what symbol to use for a particular sound. In other instances, repeated listening to the tapes may settle disagreements, If the disagreements are large in number, a third transcriber may give the input. Owing to this subjectivity, it is a common practice among speech researchers to report transcription agreement coefficients, when describing findings based on phonetic transcription. Although such coefficients are intended to give an indication of the degree of transcription accuracy, in reality it is not clear to what extent high agreement coefficients do indeed guarantee great transcription accuracy (Cucchiarini, 1996). Agreement types such as intra judge, inter judge is taken into account as that will tell about the reliability of the transcription. Thus accuracy can be checked. .

Steps in speech and language transcription Tiffancy & Carrell (1987) state that transcription skills are acquired in a series of steps of graded difficultywhich are as follows

- First learn the appropriate form of the symbols and make certain that you understand the distinction between phonemic and phonetic transcription.
- Learn to associate each symbol with a model utterance.
- Begin to identify the important variant forms, or allophones, typically found for each sound class.
- Learn to identify and transcribe both sound segments and stress patterns in short multisyllabic utterances, assigning the appropriate symbols to the syllables.
- Learn to identify the common consonant combinations in single contexts.
- Learn to transcribe the sounds which appear in unexpected sequences.
- Learn to identify non – English phones and assign to them the appropriate symbols. (bilabial, fricative, flap etc).
- Learn to transcribe "slurred" or reduced and elliptic speech as well as the sound patterns typical of speech defects.
- Finally be a keen listener to catch differences in different sounds. (Tiffancy & Carrell, 1987).

Phonetic transcription is a record of the listener's impression of what he or she hears. The transcriber's task is to make sure that this impression is one which is based upon speech cues, not alphabet cues. S/he should hear complete word as a word and not as individual sounds. Since, transcription does not depend on the spelling of the word but depends on its pronunciation perception of individual sounds by the transcriber is crucial for efficient transcription. In short, transcription is an auditory perceptual task, and it is dependent on speech sounds and not on written alphabets or letters. It is not possible to transcribe the word "through" – only some particular pronunciation of it. That pronunciation may be an imaginary one, made by a hypothetical model speaker who always pronounces the word in a clear and exact manner, in precise accordance with the known rules of the language. But speech is never exact and the rules vary more widely than we usually assume. A transcriber can transcribe only real utterances. At normal speech rates we are able to listen analytically to no more than one or two segments at a time. For those reasons repetition of utterances is required. This can be accomplished in one of three ways:

- Through repetition of the utterance by the speaker (dangerous as repetition may bring about self – conscious changes).
- By repeated listening to recordings of an utterance, or

- By analyzing transciber's repeated imitations of the informant's speech. This is practicable only if the transcriber is a good imitator (Tiffancy & Carrell, 1987).

Procedure which will help in phonetic transcription:

- While transcribing a speech sample, try to determine the number of syllables that will be heard as rhythmical pulses. Since the syllable is a kind of basic element of speech, it should be the first step in transcription.
- After the syllable divisions are determined, basic, distinguishing sound quality of each pulse – usually a vowel or diphthong resonance should be checked.. These may then be recorded, allowing a suitable amount of shape between them for the recording of the nonsyllabic symbols. The phrase "now let me sleep" might look like this: [aU ɛ i I].
- Appropriate consonant symbols or symbol combinations from a model set to be inserted depending on how each syllable was started and stopped.
- Identification of the manner in which each segment departs from "standard", by employing segmental symbols from a larger set, or by the use of modifying symbols.
- Finally, the nonsegmental symbols to be added if found necessary for the purpose. (symbols for stress, length, pitch, quality, etc.) (Tiffancy & Carrell, 1987).

The above steps are only broad guidelines. An individual transcriber may employ his/her own strategies based on the above guidelines.

Phonetic transcription of disordered speech

Speech and Language Pathologists are the one who deal with the disordered speech. Most Speech Language Pathologists are trained in phonetic transcription using the International Phonetic Alphabet (IPA). However, as the material is stored it must eventually be transcribed phonetically, to paper. This is done to serve as an input to the various phonological assessment techniques available, and to be readily available to other clinicians if necessary. In dyasrthric speech, phonological disorders, stutter speech (where number of repetitions, pauses should be notes), apraxic speech the systematic transcription of the client's speech will reflect the kind of errors present, which will in turn help in assessment.

Phonetic transcription generally and for clinical purposes will differ in terms of quality and the type of transcription. As for clinical population, transcriber has to consider more detailed aspects. However, the kind of transcription to be employed depends on the nature of speech sample. It is not always the precise articulatory quality but also other aspects of speech to be examined in a clinical transcription. Prosodic elements, such as the length of a segment can be important. It was noted that an apraxic was unable to utilize voicing in stops and fricatives: all such segments being voiceless. However, transcribing target /f/ and /v/ both as [f] hide the fact that the speaker was able to retain the length distinction between these sounds in normal speakers. Other prosodic features, such as voice quality, loudness, speed of speech and pitch/intonation are also potentially very important. Thus, keen observation, listening capacity is essential.

Detailed phonetic transcription is important for the paraphasias (phonemic parapahasias, semantic paraphasias) in aphasics, speech errors with cleft of lip and palate, misarticulations, lisping, dysarthric speech, acquired motor speech disorders, distortions, imprecise consonants, etc. Speech sample of a person with severe stuttering with

numerous repetitions is also likely to have changes in voice quality (including both breathy and creaky voice), velopharyngeal fricatives, pulmonic ingressive speech, quiet speech, and strong articulations. Hence, such samples would be more challenging for transcribers. .

Ball (2008) explained that the ability to transcribe disordered speech is a vital tool for speech-language pathologists, as accurate description of a client's speech output is needed for both diagnosis and effective intervention. Clients in the speech clinic often use sounds that are not part of the target sound system and which may, in some cases, be sounds not found in natural language at all. While the IPA provides a wide range of symbols that can be used in clinical transcription, the extended IPA (ext IPA) may also be needed to transcribe atypical sounds never or rarely encountered in natural language. When using the IPA and ext IPA, transcribers aim to show the client's productions, irrespective of the intended target.

Muller & Guendouzi (2002) illustrated the use of transcription for the 'discourse line' in interaction between a person with Alzheimer's disease, and a visitor. Discourse is here interpreted as a metacategory, or an analytic level of interaction The prosody and voice layer can be used to show the analysis of a speaker's use of a specific voice quality in discourse.

Sell (2005) reported that perceptual speech assessment is central to the evaluation of speech outcomes associated with cleft palate and velopharyngeal dysfunction. To draw together the many different strands in the complex process of perceptual speech assessment and analysis, and make recommendations for practice, he reviewed issues such as data sampling, data collection/recording, archiving, the advantages and disadvantages of lay and specialist listeners, approaches to data analysis, reliability, and data interpretation. The need to capture meaningfully the sound of speech based on detailed phonetic analysis was argued. And also described some of the differences in measuring speech for clinical, audit and research activities. Blind independent analysis of speech data by specialist therapists is recommended as the gold standard methodological approach when reporting audit and research outcomes. They advocated the requirement for ongoing training in listening skills for specialist therapists. .

Disordered speech contains lot of other features which are impossible to explain and transcribe solely based on IPA as accuracy may be lost in this. To get more accurate transcription of disordered speech, recently, the IPA had set up a committee to extend the alphabet to include symbols for non normal speech. The resultant “extension to the IPA” was based to some extent on the PRDS symbols, but also included some of the prosodic features.

Members of International Phonetic Association made 1st attempt to revise the IPA in 1989. There one party worked on the transcription of disordered speech. Apart from this modifications were made to main IPA consonant and vowel chart which has relevance for the transcription of disordered speech. Extensions to the IPA, often abbreviated as extIPA, is a group of symbols whose original purpose was to accurately transcribe disordered speech. At the IPA Kiel Convention in 1989, a group of linguists drew up the initial set of symbols for the Extended IPA. Extensions to the IPA were first published in 1990, and modified over the next few years before its official publication in the Journal of the International Phonetic Association in 1994 allowed it to be officially adopted by the ICPLA. While its original purpose was to transcribe disordered speech, linguists have used it to designate a number of unique sounds within standard communication, such as hushing, gnashing teeth, and smacking lips. The Extensions to the IPA have also been used to record certain peculiarities in an individual's voice, such as nasalized voicing. Aside from the extIPA, another set of symbols is used for voice quality (VoQS), such as whispering.

Extensions to the International Phonetic Alphabet (IPA) have been recommended for the narrow transcription of disordered speech. The relationship between these

extensions and previous suggestions for transcribing atypical speech made by the working party for the Phonetic Representation of Disordered Speech (PRDS). By including transcription of aspects of connected speech such as voice quality, rate and intensity and by permitting uncertainty in transcription to be indicated. (Duckworth, Allen, Haerdcastle, & Ball, 1990). These 'Extensions' symbols are listed at the end of the chart.

It is recommended that all clinicians working with disordered speech should use these symbols wherever possible in order to promote a common system of phonetic representation. And for describing each aspect of disordered speech in detail. The special symbols are divided into several sections.

1st section: Other segmental features: symbols and diacritics - which deals with segments not represented on the main IPA chat and is further subdivide into place of articulation (example: dentolabials and bilabials), manner of articulation (e.g. nasal fricatives and reiterated articulation), air stream e.g. non –normal ingressive/ aggressive and silent articulation), and vocal fold activity (e.g. partial voicing/ devoicing and pre aspiration).

2nd section: Degrees of Indeterminacy: This deals with indeterminacy. This is useful for the clinician, and allows the representation of various degrees of certainty in the recognition of a segment. This ranges from the perception only of a segment with no further detailed clear, to the marking of what is thought to be a specific segment, but noting a slight degree of doubt. This is intended for those cases where, for several reasons of severe distortions (e.g. due to pathological conditions), the phonetic specification of an utterance cannot be made with reasonable degree of accuracy.

If the sounds are produced accurately it is easy to understand what is been said. But some errors are quite direct such as additions, substitutions, and omissions etc which are easy to write it down. But in some cases like disordered phonology, dysarthric speech (imprecise articulation), muffled speech where distortion of sounds are present, it difficult to represent. In such cases these symbols are useful to get clear picture of person's articulation abilities.

3rd section: Voice quality: It has symbolization for voice quality, based on phonatory activity (e.g. whisper/creak), or ariculatory features (e.g. palatal or labial voice quality). The symbols here can be either used for stretches of speech or for individual segments. Single segments or strings may be produced with a particular type of vocal cord vibration and / or suprasegmental ariculatory configuration. This results in secondary articulation of individual segments or an overall voice quality characterized by long – term articulatory settings.

As we know that voice represents a person and it is a personal identity. Pleasant voice quality is always required. These symbols are useful to denote abnormal voice qualities, while speaking. Also can be useful for dysarthic speech.

4th section: **Other features of connected speech:** It is the final Section of extensions of IPA that covers other aspects of connected speech. These included pausing, where different length of pause can be symbolized, and loudness and rate of speech. As with the voice quality markings, stretches of speech of a particular loudness or speed can be marked off through the use of braces (Ball M. J.)

Adequate pauses, rate of speech, loudness etc are important aspects of persons speech to understand. If these features are unusual as in case of stuttered / cluttered speech, it is difficult to follow.

Actually, people working with individuals who have speech which is not the same as that of the adult community in which they live, have long recognized the limitations of the International Phonetic Alphabet (IPA) for transcribing such speech. There have been long attempts to overcome these limitations. Extended range of the IPA permit the narrower transcription of natural languages or to summarize the

diversity of transcriptional practices used by phoneticians and linguists.

With the help of Extended IPA it is possible to describe absence of nasal resonances, unusual lip rounding, and audible nasal escape as in cleft palate speech, speech with velopharyngeal insufficiency or in competency, reiterations or repetitions seen in stuttered speech or at times seen in dysarthric speech also. A sound characteristic of some speakers with VPP incompetence is 'snort' or fricative resulting from the approximation but inadequate closure of the upper border of the velum and the posterior pharyngeal wall. The frication is generated therefore at the velopharyngeal place of articulation.

Apart from this any form of reiterated articulation is to be indicated or document, speech produced without an air stream, i.e., lipped or mouthed speech, phonologically voiced segment when is partly devoiced (As devoicing is atypical for the language in which it occurs), aspiration occurring before the closed phase of a top and uncertainty because of noise (as it will obscure the recording, this obscuring noise may be speech or non speech). This can also be indicated rather than encountering no symbol at all.

Precautions for transcribers

As most of us already know how to spell, it is often assumed that we therefore are all equally aware of the sound shapes, or form, of our own language. This task requires careful, often repeated and sophisticated listening, especially in view of the twin fact that

- Spelling may seriously mislead us as to the sound structure of a syllable or word and
- Our perceptions may, as a result of incomplete reception or faulty analysis, be false to the facts. Nevertheless, it is possible to perform a perceptual analysis of speech and to record our perceptions in the form of a phonetic transcription.

Segmentation is an important aspect. As the segmentation which phonetic description requires is not always transparently available in the phonetic event, and impressionistic transcriptions may have to contain unresolved ambiguities until sufficient is known about the structure of the particular language. Moreover, such uncertainties of segmentation will often form the basis of alternative proposals for phonemic interpretation.

Another aspect is aligning the segments as they will have influence on each other. Thus all these things should be kept in mind while transcribing.

Description of the IPA chart/ Guide to IPA notation / Exemplification of the symbols

Behind the system of notation known as the IPA lie a number of theoretical assumptions about speech and how it can be analyzed. These include the following:

- Some aspects of speech are linguistically relevant, whilst others (such as personal voice quality) are not.
- Speech can be represented partly as a sequence of discrete sounds or 'segments'.
- Segments can usefully be dividing into two major categories, consonants and vowels.
- The phonetic description of consonants and vowels can be made with reference to how they are produced and to their auditory characteristics.
- In addition to the segments, a number of 'suprasegmental' aspects of speech, such as stress and tone, need to be represented independently of the segments.

The IPA is summarized in the IPA chart for the ease of reference. The structure of the chart reflects the above assumptions. The following subsections provide a brief introduction to phonetic description in the context of these underlying assumptions, while reflecting to the relevant parts of the chart.

The general value of the symbols in the chart is listed below. In each case, a symbol can be regarded as a short hand equivalent to a phonetic description and a way of representing the constructing sounds that occur in a language thus [m] is equivalent to voiced bilabial nasal and is also a way of representing one of the constructing nasal sounds that occur in English and other Indian languages.

When a symbol is said to be suitable for the representation of sounds in two languages it does not necessarily mean that the sound in the two languages are identical. That is either one of [p] or [b] could be used to transcribe *bee* in English and *bis* in French. However, the corresponding sounds are not the same in two languages.

All languages exhibit variations in their pronunciation. And every language has their own set of vowels and consonants. Some of them may not be originally from that language but will be borrowed from other languages or loan sounds. For example: [æ] is not an original vowel in Indian languages but it is a loan vowel. So such modifications are possible over a period of time.

On the IPA chart revise to 2005, there are separate sections for vowels and for consonants, reflecting different techniques for describing them. The different techniques arise from the more closed articulation of consonants and the more open articulation of vowels. IPA chart covers pulmonic and non – pulmonic consonants, vowels, other symbols, suprasegmentals diacritics and tones and word accents. We will be considering each section separately. Let us describe it individually.

Vowels

The famous English phonetician Daniel Jones provided vowel models and termed as cardinal vowels. The complete set of IPA vowel symbols is shown in quadrilateral on the chart. In addition to cardinals' vowels, which lie on outside edge of the quadrilateral, there are symbols of mid central vowels, and for vowels at the number of intermediate locations. The other aspect considered while defining these vowels are: Vowels are made by constricting the vocal tract in the front, central or back areas, constricting it to a greater or lesser degree (a high or a low tongue position), and producing the vowel with greater or lesser force or tension. It is primarily in terms of these categories of fronting, height, and tension, lip rounding, that we describe major vowels.

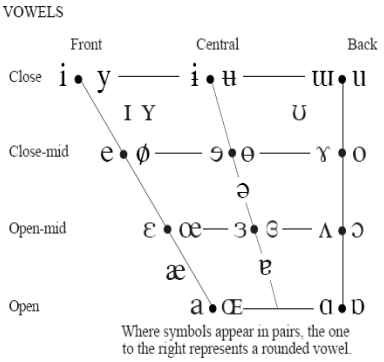
The IPA defines a vowel as a sound which occurs at a syllable center. The IPA maps the vowels according to the position of the tongue. The vertical axis of the chart is mapped by vowel height. Vowels pronounced with the tongue lowered are at the bottom, and vowels pronounced with the tongue raised are at the top. For example, [ɑ] is at the bottom because the tongue is lowered in this position. However, [i] is at the top because the sound is said with the tongue raised to the roof of the mouth.

In a similar fashion, the horizontal axis of the chart is determined by vowel backness. Vowels with the tongue moved towards the front of the mouth (such as [ɛ]) are to the left in the chart, while those in which it is moved to the back (such as [ʌ]) are placed to the right in the chart.

There is pair of symbols for unrounded and rounded. One which is to the right side of the pair represents a rounded vowel (in which the lips are rounded) and which is to the left side represents unrounded vowels. Some characters correspond to letters of English alphabet, but others had to be borrowed from various sources. Here, the four vowels are defined based on the heights: [i] and [u] are close vowels, [e] and [o] are close mid vowels, [ɛ] and [ɔ] are open-mid vowels and [a] and [ɑ] are open vowels (note that in this last pair the difference in letter shape is important, signifying a front vowel and a back vowel respectively). The eight reference vowels are known as the '***primary cardinal vowels'.*** 'Cardinal 'in this sense refers to points on which the system of description hinges. The primary cardinal vowels are often referred to by numbers ordered anticlockwise round the quadrilateral: 1 [i], 2[e], 3[ɛ], 4[a], 5[ɑ], 6[ɔ], 7[o], 8[u].

By considering the, lip activity in the back series of cardinal vowels ([a ɔ o u]), lip-rounding progressively increases, from none on [ɑ] to close rounding on [u]. By convention unrounded vowels are placed to the left of the front or back of the quadrilateral, and rounded vowels to the right. Conversely in the front series [a ɛ e i] the lips are neutral for [a], and become progressively more spread through the series to [i]. The fact that [i e ɛ a ɑ] are unrounded, and [o u] have increasing rounding, reflects a relationship commonly found in languages between vowel height, backless, and rounding. Lip activity is however, independent of tongue position, and many languages explicit this in their vowel systems.

To reflect the, eight ***'secondary cardinal vowels'*** are therefore defined which differ only in lip position from their primary counterparts. These are shown paired with their primary counter parts. So, for example of the close vowels [i, y ɯ u], [i ɯ] have spread lips and [y u] have closely rounded lips; and of the open mid vowels [ɛ œ ʌ ɔ], [ɛ ʌ] have slightly spread lips and [œ ʌ ɔ] have open rounding. A further two secondary cardinal vowels are defined; these are closed central vowels [ɨ] (spread) and [ʉ] (close rounded). The secondary cardinal vowels are sometimes referred to by the no. of corresponding primary cardinal vowel , for example [ɸ] is "secondary cardinal 2",or they are numbered anti-clockwise round the quadrilateral from 9[y] to 16[ɯ] ,[ɨ] and [ʉ]are then numbered 17 and 18 respectively.



I.

[i] as in 'east' [ist] and 'seen' [sin]. The symbol is a lower case (small) printed dotted i. the tongue constriction should be felt as tense, in the front of the oral cavity, as and higher than any other vowel. This is present in most of the Indian languages.

[I] as in 'sit' [sIt] and 'build' [bIld]. The symbol is a small capital I. the sound is shorter than [i] as a rule, and the tongue, while still high and forward, is less so than for [i]. The tongue should also feel lax by comparison. This is present in most of the Indian languages.

[e] as in "steak" [stek] and "rain" [ren]. The symbol is the lower case e. The tongue is fronted and its height is about midway between the positions for [i] and [æ]. It is a tense vowel and in stressed syllables is likely to be noticeably diphthongal. This is present in most of the Indian languages.

[ɛ] as in "bed" [bɛd] and "head" [hɛd]. The symbol is the Greek letter epsilon. The sound is shorter than [e] and simpler. The tongue position is lower than for [e]. It is more lax. This is present in most of the Indian languages.

[æ] as in "hat" [hæt] and "cat" [kæt]. The symbol is a ligature of the letters [a] and [e]. the tongue position is also front, but not so far as for the other front vowels, and it is markedly lower. The jaw too is usually markedly lower. Originally this vowel was not present in Indian languages but over a period of time it is borrowed from English.

[u] as in "too" [tu] and boom [bum]. The symbol is the lower case letter u. this is the highest of the back vowels. It is classes as tense and tends to be longer and more diphthongal than the other high – back vowel, the [U]. It is produced with strongly rounded lips. This is present in most of the Indian languages.

[U] as in " look" and 'put" [pUt]. The symbol is small capital u. this back – vowel sound is shorter and simpler the [u], the tongue is less high and less strongly retracted than for [u], and the lips are less closely rounded. This is present in most of the Indian languages.

[o] as in "coat" [kot] and "note" [not]. The symbol is a lower case o. in terms of tongue height it is mid – back, not high not low. The sound is tense, often long and

diphthongal, and the lips are strongly rounded. This is present in most of the Indian languages.

[ɔ] as in “law” [lɔ] and “ caught” [kɔt]. The symbol is called the open o. the tongue position is slightly lower than for [o]. And the lips are less tightly rounded. The sound is described as lax.

[ɑ] “cot” [k t]. The symbol resembles the script form of the letter a. the tongue position is far back, markedly low, but the lips are not rounded.

[ɝ] as in “ term” [t ɝm] and “stir” [stɝ]. The symbol is the reversed hooked epsilon. This vowel is usually described as central, but has a more complex tongue posture than other vowels, giving it a highly distinctive resonance called “r-colored”.

[ʌ] as in “ cup” [kʌp] and “ done” [dʌn]. The symbol is the caret or upside down v. the tongue is a bit back of the central but, it is not “back”. The sound is simple, short and lax.

[ə] as in “alone” [əlon] and ‘ today” [təde]. The symbol is an upside down backward e. this is reduced vowel, or vowel murmur. It is all that is left of any vowel which becomes so weak or short that definite resonance is lost. It may sound a bit like a very short [ʌ], but we will find later that this is not actually a correct characterization of [ə]. This vowel is called the schwa vowel and is the most common of all syllabics.

[ɚ] as in “motor” [motɚ] and “later” [letɚ]. This schwar symbol is often called the hooked schwa, and is used to represent a weak, schwar like syllable with some r coloring retained. Schwar and schwa are important allophones of other vowels. (Tiffancy, & Carrell, 1987).

The vowel [ə] often referred to as schwa, lies at middle of vowel quadrilateral, and [ɒ] lies between open-mid and open. The vowels [I Y ʊ] are mid centralized from [I y u] respectively.

Dipthongs

A diphthong ("two sounds" or "two tones"), also known as a gliding vowel, refers to two adjacent vowel sounds occurring within the same syllable.

[aI] as in “high” [haI] and “spite” [spaIt]. This represents a vowel resonance midway between [a] and [æ].

[au] as in “house” [haus]. Notice the nuclear and off glide parts to this dipthong – from a stressed [a] to off glide [u].

[ɔI] as in “ boy” [bɔI] and “noise” [nɔIz]. This dipthong represents an off glide from the nuclear [ə] to the [I]. And [ju] as in “use” [juz] and “few” [fju]. It consists of an on glide from [j].

Consonants

In the IPA chart, consonants are separately placed at the top of the chart and are divided into *pulmonic* and *pulmonic* consonants.

a) Pulmonic consonants

Pulmonic consonants are the one which are produced by obstructing the glottis (the space between the vocal cords) or oral cavity (the mouth) and either simultaneously or subsequently letting out air from the lungs. Pulmonic consonants make up the majority of consonants in the IPA, as well as in human language. All consonants in most of the Indian languages fall into this category.

On the IPA chart, symbols for the majority of the pulmonic consonants are found in the large table at the top. These consonants are majorly classified based on their place, manner of articulation, voicing and aspiration. The symbols are exemplified in the order in which they appear on the chart and they are discussed using the term given as a heading for the rows and columns.

Each column represents a ***place of articulation***, which is reflected in the labels across the top of the table from bilabial at the left to glottal (voiced consonants made by the vocal folds vibration) at the right. The terms ‘bilabial’ and ‘labiodental’ indicate that the consonant is made by the lower lip against the upper lip and the upper front teeth

respectively; otherwise it is normally assumed that the sound at a named place of articulation is made by the articulatory lying opposite the place of articulation (so alveolars are made with the tip of the tongue or the blade which lies just behind the tip). The exception to this is the term 'retroflex'. In the retroflex sounds, the tip of the tongue is curled back from its normal position to a point behind the alveolar ridge. Usually alveolar [t] shares some degree of this curling back of the tongue tip, which distinguishes it from other alveolars. Note that except in the case of fricatives only one symbol is provided for dental/ alveoplar/ postalveolar; if necessary, these three places can be distinguished by the use of extra marks or 'diacritics' to form composite symbols, as be represented as [n ɳ ŋ] respectively.

The rows of the consonant table, labeled at the left side by terms such as plosive, nasal, trill, and so on, reflect another major descriptive dimension for consonants, namely ***'manner of articulation'.*** Manner of articulation covers a number of distinct factors to do with the articulation of a sound. One is the degree of stricture (narrowing) of the vocal tract involved. If the articulation of the plosive [t] is modified so that the tongue tip or blade forms a narrow groove running from front to back along the alveolar ridge, instead of an airtight closure, air can escape. The airflow is turbulent, and this creates sound of a hissing kind known in phonetics as frication. Such a sound is called a fricative. In this case the resultant sound would be [s] as in *sin*. Other fricatives include [f] as in *fin* and [ʃ] as in *shine*. If even less narrowing is made in the vocal tract, an approximant will result, in which the airflow is not turbulent and no frication is audible. Approximants are exemplified by the sound [j] at the start of *yet*.

'Manner of articulation 'also includes important factors such as whether the velum (the soft part of the palate at the back of the mouth) is raised or lowered. If it is lowered, as for the sounds [m] and [n] in man, the resonances of the nasal cavity will contribute to the sounds. Consonants where this happens are called nasals. Laterals (lateral approximants such as English[l] in let and lateral fricatives such as welsch [l] in llan, church) are sounds where air escapes not in the mid line of the vocal track but at the side. Trills are sounds like [r] in Hindi ruk 'wait' or ram 'a name of person', in which the air is repeatedly interrupted by an articulator (in this case the tongue tip) vibrating in an air stream. A very short contact, similar in duration to one cycle of the vibration of a trill, is called a tap such as the [ɣ] in Spanish pero 'but'.

Further important factor in the description of consonants is not shown in the column or in row labels is whether the consonant is voiced or voiceless. In voiced consonants the vocal folds are producing acoustic energy by vibrating as air passes between them and in voiceless ones they are not. A symbol on the left of a cell in the table is for a voiceless consonant as [p] and one on the right is for a voiced consonants e.g. [b] (the voiced counter part of [p]) and [m]. Voicing distinctions are actually finer grained than implied by this two way distinction, so it may be necessary to add to the notation allowed by the two basic symbols. For instance, the symbolization (ba pa pha) implies consonants in which the vocal folds are, respectively, vibrating during the plosive closure, vibrating only from the release of the closure, and vibrating only from a time well after the release (giving what is often known as an aspirated plosive). Where a cell contains only one symbol, it indicates (with one exception) a voiced consonant and is placed on the right. The exception is the glottal plosive [ʔ] (as the vocal cords are closed, they are unable simultaneously to vibrate). The extent of voicing may vary considerably. The voiceless consonants may be not only voiceless but also aspirated and the voiced consonant may be voiced throughout either duration, or may have voicing during only part of the time. Usually the use of pair of symbols such as a [p] and [b] in a given language signifies only that there is a contrast in a degree of voicing within the pair of sounds. Either of the variant letter shapes

[g] and [g] may be used to represent the voiced velar plosive.

Not all cells or halves of the cells in the consonant table contain symbols. There are gaps in the table and these gaps are of three kinds.

Shaded cells occur where the intersection of a manner and a place of articulation define a sound which is thought not to be possible, either by definition (a nasal requires an oral occlusion combined with lowering of the velum, and so a pharyngeal or glottal nasal is ruled out), or because the sound is impossible or too difficult to produce, such as a velar trill or a bilabial lateral fricative. Unless phoneticians are mistaken in their view of the latter category of sound, no symbols will be needed for any of the shaded cells.

An **unshaded gap**, such as the velar lateral fricative, may indicate that the sound in question can be produced, but has not been found in languages. It is always possible that a language will be discovered which requires the gap to be filled in. A case of this kind is the velar lateral approximant [L], which only became generally known among phoneticians in the 1070's when it was reported in Lanite, a language of Paua New Guinea. An unshaded gap may also occur where a sound can be represented by using an existing symbol but giving it a slightly different value, with or without an added mark separate from the symbol. A symbol such as [β], shown on the chart in the position for a voiced bilabial fricative, can also be used to represent a voiced bilabial approximant if needed.

First note that the IPA symbols for 16 of the Roman consonant sounds are the same as familiar letters of the conventional alphabet, and indicate pronunciations usually associated with these letters by English speakers. These are the sounds present in most of the Indian languages such as Hindi, south Indian /Dravidian languages, Marathi, Bengali, etc. The symbols which retain their associations are:

[p] as in 'pen' [pɛn] [pa:l][pəl]

[b] as in 'ben' [bɛn][babu][bal]

[t] as in 'ten' [tɛn][tata]

[d] as in 'den' [dɛn][daɬ]

[k] as in 'kay'[ke][kam][kan]

[g] as in 'gay' [ge][gaj][gəməla]

[f] as in 'few' [fju][fæn]

[v] as in 'view' [vju]

[s] as in 'say' [se][sa:l][səlam]

[z] as in 'bays' [bez][zopaɬa]

[h] as in 'hay' [he][ha:ɵi]

[m] as in 'some' [sʌm][mal]

[n] as in 'sun' [sʌn][nəkaʃa]

[l] as in 'lay' [le][la:mb]

[w] as in 'way' [we][was]

[r] as in 'run' [rʌn] (Tiffancy & Carrell, 1987)

Other symbols are (Tiffancy & Carrell, 1987)

[θ] as in 'think' [θIŋk] and 'thick' [θIk] this is a voiceless sound. The IPA symbol is the letter theta of the Greek alphabet. Present in Marathi and other Dravidian languages like Telugu.

[ð]as in 'that' [ð æt] and 'those' [ð oz] voiced. This symbol is an old English letter called eth or rdh, it is still used in modern Icelandic. Present in all Indian languages.

[ʃ] as in 'she' [ʃi] and 'sugar' [ʃUĝ].IPA symbol employed for the hissing sound is similar to the mathematical integral sign and takes the form of a '*stetched'* letters. note that in writing this symbol, the tail should stretch below the line. The sound is sometimes called an *esh.* Absent in Bhojpuri, Bihari language.

[z] as in 'beige' [bez] and vision [vIzən]. This sound is voiced. In written form the tail of the symbol should also stretch below the line. Not found in Indian languages.

[tʃ] as in 'chew' [tʃu] and 'cheese' [tʃiz]. This symbol is composed of two characters and when feasible may be written as a *ligature (*two symbols touching or tied together). As an alternative to [tʃ], some systems of notation employ the character [č] (c- wedge), a usage which is becoming more common. Present in Indian languages.

[dz] as in 'jew' [dzu] and 'age' [edz]. This may be written where feasible as a ligature combining [d] and [z]. This is

voiced sound. Use of the single character [ĵ] (j wedge) for this sound is common.

[ŋ] as in ' sing' [sIŋ] and 'sung' [sʌŋ] . This is common English nasal sound often represented in conventional spelling by the letter ng. In form, the character resembles the letter n with the second down stroke curled under below line. The sound is often called an eng.

[hw] as in 'when' [hwɛn] and 'why' [hwaI]. This may also be written as a ligature if feasible. The sound is a voiceless.

[j] as in 'yes' [jɛs] and 'you' [ju]. This is ordinary lower case j. in the IPA it stands for the sound we usually associated with the letter y.

[ʔ], which symbolizes glottal stop. A verbal description of the sound is difficult, but it occurs most often as a variant of certain stops and is heard commonly in the words 'huh uh' and 'uh huh' [hʌʔʌ] and [ʔʌhʌ]. This stop is a momentary interruption of the breath flow at the glottis.

One can make a retroflexed nasal ([ɳ]), is a retroflexed stops and nasals which occurs in many of the major languages of India, including Hindi, Urdu (an indo- Iranian languages spoken also in Pakistan) and Malayalam (a Dravidian language). Malayalam also makes use of retroflexed liquids[ɭ] and tap, not a trill. It has got variety of nasal sounds.

In the table, consonants across the top are labels for place. Affricates and other doubly articulated sounds are not included since the reader can put together all the relevant information on them by considering sounds. The other additional sounds are lateral fricative, epiglottal fricative, epiglottal voiced stop etc. Special symbols for some common doubly articulated sounds such as rounded velar approximants, alveolar affricatives, double articulation of ʃ and x.

b) Non- pulmonic consonants

All the symbols in the main consonant table imply consonants produced using air from the lungs (pulmonic consonants). Whilst some languages rely exclusively on air from the lungs for sound production, many languages additionally use one or both two other 'airstream mechanism' to produce some of their consonants. Non-pulmonic consonants are sounds whose airflow is not dependent on the lungs. These include clicks (found in the Khoisan languages of Africa), implosives (found in languages such as Sindhi) and ejectives (found in many Amerindian and Caucasian languages).Symbols for these sounds are given in a separate box below the main consonant table.

Ejectives

Languages also have other stop consonants which are made in the same areas as the ones, but for which other aspects of the air flow vary. One such type of sound is called as an EJECTIVE. The stops generally spoken are dependent on pulmonic air pressure that is, air pressure from the lungs. To make an ejective, the glottis closes so that the air pressure builds up behind. Then you make a momentary closure somewhere else in the vocal tract and release it along with the glottis, thus getting GLOTTALIC pressure. The sounds sort of pops from your mouth. All ejective sounds are, by definition [+ constricted glottis]. An ejective air pressure is indicated by an apostrophe after the regular IPA symbol. (Napoli, 1996).

Clicks

When one forms a complete closure somewhere in the oral cavity and then move the articulator to produce suction. The release of this suction is called a CLICK. Sounds made with this sort of suction are called VELARIC pressure sounds (as opposed to pulmonic or glottalic pressure sounds) (Napoli, 1996).

In other words, 'velaric airstream sounds, usually known as '***clicks',*** again involve creating an enclosed cavity in which the pressure of the air can be changed, but this time the back closure is made not with the glottis but with the back of the tongue against the soft palate, such that air is sucked into the mouth when the closure further forward is

released. The 'tut-tut' or 'tsk-tsk' sound, used by many English speakers as an indication of disapproval, is produced in this way, but only in isolation and not as part of ordinary words. Some other languages use clicks as consonants. A separate set of symbols such as [ʘ] is provided for clicks. Since any click involves a velar or uvular closure, it is possible to symbolize factors such as voicelessness, voicing, or nasality of the clicks by combining the click symbol with the appropriate velar or uvular symbol: [k= g= ŋ=], [q!].

Bilabial click is like a kiss and written as [ʘ]. Affricate click in that touches both the alveolar and palatal areas and sounds like a scolding noise or a noise that means what a shame! Is written as [!]. One can make that click forward to behind the dental area and make [ǀ] . Alveolar lateral is the sound like encouragement to a horse to speed along; written as [ǁ]. This is made by opening only one side of the mouth and clicking that same side of the tongue. Alveolar click sounds like a cork popping from a bottle [=]. In many languages clicks are used as interjectional noises. (Napoli, 1996)

Suprasegmentals

Phonetic information that cannot be reduced to the segmental level, as it occurs over several segments. This information is termed suprasegmental (over segments) or prosodic information. Like all phonetic data, this too can be reduced to functional or contrastive, units, and so can be described in phonetic and phonological terms.

The suprasegmental phonetic information most usually described by phoneticians includes length, stress, pitch (as intonation), voice quality, loudness and tempo which often operate on syllables, words, or phrases: that is, elements such as the intensity, pitch, and gemination of the sounds of a language, as well as the rhythm and intonation of speech. They are important because they add color to the speech and also can change the meaning of the utterance. All these features may be subject to disruption in speech disorder patients, so just as much as segmental phonology; we need to be able to profile aspects of disordered prosody. Therefore need to transcribe in detail. The IPA provides a separate set of symbols for suprasegmentals, to be found on the Chart at the bottom right corner. Like this:

SUPRASEGMENTALS

ˈ	Primary stress
ˌ	Secondary stress ˌfoʊnəˈtɪʃən
ː	Long eː
ˑ	Half-long eˑ
◌̆	Extra-short e̯
ǀ	Minor (foot) group
ǁ	Major (intonation) group
.	Syllable break ɹi.ækt
‿	Linking (absence of a break)

I.

Primary stress: is noted by the symbol [ˈ], as in the words, "above" [ə'bov] the stress mark is placed before the stressed syllable, not after, as dictionaries usually do. For secondary stress [ˌ] is used again before the syllable. Example: telephone - [ˈtɛləfon]. All words of more than one syllable have more stress on certain syllable than on others. (Tiffancy & Carrell, 1987)

Example : recognize -/ˈrekagnaIz/- 1st syllable stress

exception - /Ikˈsepsan/ -2nd syllable stress

Extra strong stress can be indicated by doubling the stress mark: [ˈˈ]

Duration: Duration of a sound is quite often a phonetically important feature. If so, a long segment can be indicated by [:] and a half long segment by [.]. (Tiffancy & Carrell, 1987) Example: a: as in [pa:l].

Phonetic transcription can be punctuated by conventional means, but while period, colons, semicolons, and commas often are correlated with pauses in speech, they are

essentially linguistic rather than phonetic symbols. Longer pause is indicated by [‖] and a short pause by [|].

Pitch variation, for instance, can operate over complete utterances to convey meaning additional to that of the words in what is generally termed "intonation". This is true in all languages, though the complexity of the international system varies across languages. The symbol [‖] can be used to mark the end of the domain of an intonation pattern, and [|] to demarcate a smaller unit. The symbols for 'global rise' and 'global fall' respectively may also be useful for intonation, although a complete international transcription will require symbols, provided on the IPA chart.

Another domain of pitch variation is the word or syllable, and such pitch variation servers to distinguish words in much the same ways as their segmental make –up does. Languages in which pitch has this function are called tone language, and are thought to form a majority of the languages of the world.

1) Tones level and word accents contour

To indicate "tones" (voice pitches) in tone languages the Association Phonetician International recommends the use of signs which, by their shapes and positions, give some indication of their musical values. Such indications can usually be effected by means of horizontal and oblique accents, thus: rising, falling, high rising, low rising, high falling, low falling, global rise and global falling tones as shown in the chart.

TONES AND WORD ACCENTS

LEVEL		CONTOUR	
◌̋ or ◌̏	Extra high	◌̌ or ◌᷄	Rising
◌́	High	◌̂	Falling
◌̄	Mid	◌᷅	High rising
◌̀	Low	◌᷈	Low rising
◌̏	Extra low	◌᷇	Rising-falling
↓	Downstep	↗	Global rise
↑	Upstep	↘	Global fall

II.

When a language contains only one rising tone, high or low, it is recommended that the superscript 'be employed to represent it. Similarly, when a language contains only one falling tone, it may be represented by '. Mid level tones can generally be left unmarked.

Occasionally it may be found desirable, especially in "narrow" tone marking, to introduce other marks. For instance, if in a language contains high – rising and low – rising tonemes the tones are subject to raisings and lowering in particular contexts, it may be necessary to use a specially shaped mark to denote the low – rising toneme.

Word Accent: Syllables are said with varying degrees of prominence. Syllable/syllables which standout or are prominent are said to be accented or to receive the accent. Therefore, word accent is thus the relative degree of prominence with which the different syllables of a word are produced. The accents may be placed either over or under the vowels, as above, or at the beginning of syllables. Monosyllabic words do not have accent.

The prominence could be because of stress/ greater breath effort/ muscular energy, expended on the articulation of this syllable. This will in turn change pitch on that syllable, lengthen the vowels, and quality of the vowel in that syllable.

The IPA has two alternative sets of symbols for indicating tones. In Languages in which lexical contrasts are predominantly dependent on the pitch movement on each syllable, ex. Chinese, so called tone letter are often used.

These letters, as in the Thai examples, indicate the tone of the preceding syllable by a vertical stroke with a line preceding it. The vertical stroke is assumed to represent five possible pitch heights within the speakers range, and the position of line shows the height and movement [if any] of the pitch on the preceding, syllable .The tone letter often used to indicate general tone movements. For example, if there is only one falling tone in a language, and no strong reason to draw attention to the particular level of its end points, it can be noted as going from the highest to lowest levels. It is also possible to use the tone letters to show more detailed transcriptions for certain purposes.

The symbols for up step and for down step are used to show modifications (raising or lowering) of the pitch indicated by ordinary tone symbols. This tone is demonstrably a high in that it has the same pitch as an initial high tone in a following word.

1) Diacritics

Diacritics are small letter –shaped symbols or other marks which can be added to a vowel or consonant symbol to modify or refine its meaning in various ways. Sub-diacritics (markings normally placed below a letter or symbol) may be placed above a symbol having a descender (informally called a tail), example: [n̥,] [j̊]. A symbol and any diacritic or diacritics attached to it are regarded as a single (complex) symbol. Other IPA symbols may appear as diacritics to represent phonetic detail: [tˢ] (fricative release), [bʱ] (breathy voice), [ˀa] (glottal onset), [ᵊ] (epenthetic schwa), [oʊ] (diphthongization). Additional diacritics were introduced in the Extensions to the IPA, which were designed principally for speech pathology. The set of diacritics approved by the IPA and revision 1989 provides a set of symbols and diacritics especially designed for the transcription of the sorts of rare or non-normal sounds encountered in disordered speech (Duckworth, Allen, Hardcastle & Ball, 1990). The diacritic markers are given in the table at the bottom left of the chart. The diacritic markers are divided into three columns. These are the complete IPA alphabet, together with the extensions for disordered speech. Diacritical marks are recommended for use to distinguish between sounds, when necessary.

A long segment may be indicated by a colon [:] placed after the lengthened symbol or by a doubled symbol. Long vowels or consonants are sometimes called geminates. Indian languages like Hindi, Marathi and Dravidian languages both long or geminates occur.

[papa] –'pope' example: In Italian,

[kul] –'oyster' example: In Korean long vowels contrast with short vowels,

[ka:l] – in marathi

Diacritics to specify such properties as nasalization, length, voicelessness, syllabicity, stress, and rounding may be combined with the phonetic symbols for more detailed phonetic transcriptions. By means of these phonetic features on can describe all speech sounds. (Victori, Fromkin and Robert Rodman holt, Rinehart & Winston 1988). A number of diacritics deal with different aspects of phonation. Two are available to reverse the voicing value otherwise implied by any symbol. Voiceless trills or nasals, for instance, for which there are otherwise no symbols. (Some diacritics may be placed above a symbol when a descended on a symbol would interfere with legibility). Vowels which occur without voicing can also be indicated. More rarely employed below the IPA symbol is [ˇ] which indicates voicing in a symbol otherwise implying noiselessness. It sometimes indicates the spreading of voicing from an adjacent segment ('assimilation' of voicing), as in French. The diacritic [ʰ] is used to above to indicate a release of air after a consonant, most commonly between a voiceless plosive and a vowel as in [tʰaI] *tie*. Two different phonation types which are used contrastively by some languages, creaky voice and breathy voice, can be indicated on vowels or consonants. A small circle under an IPA consonant indicates lack of voicing on a normally voiced sound. A small vertical line under an IPA consonant indicates that this consonant is syllabic. Retroflexing is indicated by a

rightward-curving hook at the bottom right of a symbol. Implosive sounds are indicated by a rightward-curving hook at the top right or left of a symbol. IPA marks voiceless sounds that are typically voiced with a small circle under the regular IPA symbol, such as [!]. Another way to mark them is to use the corresponding capital letters, [L]. (Napoli, 1996)

Whispery quality shown by removing all voicing. Creaky voice quality; if one is making the low sound of a rusty hinge on a door while telling a horror story. This is indicated by a diacritics tilda ~ under the IPA regular symbol. Here all sounds involve vibration of the glottis, but only one end of the vocal cords can vibrate. Secondary articulation is also called as labialization. Ex [k], [g] and give secondary labialization. Labialization is indicated with a raised w: [kw], [gw]. Napoli (1996)

The diacritics shown in rows four to nine of the first column of the diacritic table, together with the diacritics for raised and lowered shown to the right in rows nine and ten, can be used to modify the lip or a tongue position implied by a vowel symbol.

The diacritic for raised and ‘ lowered’ , when applied to a consonant symbols , change its manner category , so that [t] could be used to indicate an articulation like that of an alveolar plosive but one in which complete closure is not achieved , yielding a fricative – like sound (but lacking grooved tongue shape of [s]) as in some Irish English pronunciation of the sound at the end of right . The diacritics for ’advanced’ and retracted are also commonly used to modify consonant place of articulation. So, for instance, a voiceless fricative at the front of the velar region could be symbolized [x], and a specifically post alveolar nasal [n].

The’ rhoticity’ diacritic [ɛ̆] indicative a vowel with a specific auditory effect like that of the vowel in American [fɑ˞] *far* and [fɝ] *fur* [the combination of the ‘rhoticity ’diacritic with [ə] is often written and printed [ɚ]. The auditory effects is probably caused by constriction in the pharynx combined with an expansion of the space in the mouth in front of tongue , either by curling the tongue tip up and back , by retracting it into the body while ‘bunching’ the tongue body upwards the pre-velar region . In some languages the tongue root functions independently of other determinants of vowel quality, adjusting in the width of the pharynx, and at the bottom right of the table there are two diacritics to indicate advancement and retraction of the tongue root. The ‘syllabic’ diacritic is used to mark consonants which are acting as syllable nuclei, and the non-syllabic diacritic to mark vowels which are not fulfilling their customary syllabic role.

The ‘dental’ diacritic (third column) modifies those consonant symbols found under ‘alveolar’ to indicate unambiguously a dental articulation. Although only one symbol is provided in the consonant table (except in the fricative row), dental\alveolar\post alveolar can be distinguished as [n n n] (post alveolar being marked by the ‘retracted diacritic’). The ‘linguolabial’ diacritic, which is used to symbolize an otherwise omitted (and very rare) consonantal type, indicates the sound made with the tip or blade of the tongue against the upper lip. The diacritic is used to modify the relevant alveolar consonant symbol. The diacritics for ‘apical’ and ‘luminal’ make specific which part of the front most area of the tongue is making an articulation: the tip (apical), or the blade (luminal).

There are three diacritics in the third column dealing with release (‘nasal release’, ‘lateral release’, and ‘no nasal release’). All three show that a stop has not been released into a vowel. Instead, the air escape is through the nose (e.g. [bʌt^{h} n] *button)*, round the side of the tongue (e.g. [bɒt^{l} ɬ] bottle), or the air is not released until a later sound [ræg□bæg] *ragbag*.

Diacritics for vowels: The symbol ¬ below a vowel indicates that it is nonsyllabic. A rightward hook under a vowel indicates nasalization; alternatively, a tilde can indicate nasalization. Tone marks above vowels are ‘for high tone and ‘for low tone. The diacritic ˇ over a vowel

indicates very short duration. A macron over a vowel indicates long duration. Alternatively, a colon: after a vowel indicates long duration, example: [a:]. An acute accent (‘) over a vowel can indicate primary stress. (Napoli, 1996)

Secondary articulation is narrowing of the vocal tract which is less narrow than the main one producing a consonant. The names palatalisation, velarization, and pharyngelization make explicit where the narrowing is. In one sense a secondary articulation is superimposition of a close –vowel –like articulation on a consonant – [i] for palatalization ,symbolized for instance [t^j] ,[ɪɪ] for valorization ([t^y]) and [ɑ] for phapryngelization ([t?]) . Labialization strictly means reduction f the opening of the lips .However it has to be tended to be used for the commonly found combination of rounding (protrusion) of the lips accompanied by velar constriction. It is for such labially round valorization that the superscript [^{w}] is most appropriate. If it is necessary to distinguish a secondary reduction of the lip opening accompanied by neither protrusion nor velar constriction, a superscript [^{v}] (the symbol for labiodentals approximate) might be used. The superscript diacritics ‘a raised w’ which are placed after the symbol look rather as if they imply a sequence of events; but strictly the notation means the secondary articulation is simultaneous with the consonant. This is unlike the case of aspiration diacritics (e.g. [t^h])where the plosive and the aspiration are sequential. The simultaneity of the secondary articulation is clearer from the alternative diacritic for symbolizing velarisation or pharyngelization, [~] , which is placed through the consonant symbol in question (often to the determent of legality). Nasalization, despite the similarity of name, it is not a secondary articulation in the same sense, but the addition of the resonance of the nasal cavities to a sound. Vowels [e.g. [ã]) and consonants([ɹ]) can be nasalized.

2) Other symbols

These symbols are included in the section named other symbols of the chart for presentational conveniences. The section contains several consonants symbol which would not fit easily into the ‘place and manner ‘grid of the main consonant table. In some cases, such as the epiglottis and the alveoli – palatals, no column is provided for the place of articulation because of its rarity and the small number of types sounds which are found there. In other cases, where the sound involves two places of articulation simultaneously, and makes it inconvenient to display in the table. If separate columns for all consonant with two places of articulation were provided, the size of the grid become unmanageable. Therefore, mostly they are placed separately. Consonants that involve two simultaneous places of articulation are written by combining two symbols with the ‘tie – bar’ [^], for example [$^{k\text{^}p}$] which represent a voiceless labial- velar plosive.

- Different languages are spoken all over the world, especially in India.
- Linguistics has developed symbols for phonetic transcription in which each sound is represented by just one symbol and each symbol represents just one sound.
- Phonetic symbols are called as International Phonetic Alphabet and the association is called as International Phonetic Association.
- Both the association and the alphabet are abbreviated as IPA.
- The alphabets were not developed by ‘ spelling reformers’ but by scholars interested in methods by which speech sounds could be described and symbolized. This interest led the International Phonetics Association (IPA) to develop a phonetic alphabet in 1888 that could be used to symbolize the sounds found in all languages.

- As many languages use a Roman alphabet like that used in the English writing system, the IPA phonetic symbols are based on the Roman letters
- The IPA is intended as a commonly agreed tool for analyzing and representing the phonetic properties of any language.
- These phonetic symbols have a consistent value, unlike primary letters, which may or may not represent the same sounds in the same or different languages.
- The IPA phonetic alphabet is still the primary one used all over the world today by phoneticians, language teachers, speech pathologists, linguists, transcribers and anyone wishing to symbolize the spoken word. They are helpful to all these disciplines
- The central; principle of phonetic alphabet best suited for speech analysis is that it should consist of symbols. Which represent sounds with the greatest consistency and least ambiguity, within the limits of what is possible.
- Each phoneme class is represented by a single syllable and that, in so far as possible, provision is made for noting allophonic and other variations by means of diacritics marks.
- IPA works on specific set of principles.
- Since its creation, the IPA has undergone a number of revisions. The recent version published is in 2005.
- IPA can be useful for research, second language learners, in computers, to speech language pathologists for differential diagnosis and to plan remediation, singers, blind people, transcribers, dictionaries and for many more purposes.
- Person has to learn the symbols and how they are produced to acquire the skills of transcription. Phonetic transcription is a perceptual task, so person has to be a keen listener. Audio visual cues are also important.
- Variables like sampling mode (continuous speech; articulation tests), agreement type (intra-judge; inter-judge), and level of transcription (broad; narrow) should be kept in mind while transcribing.
- When it comes to making an actual transcription, it is important that transcribers divorce themselves as much as possible from their linguistic backgrounds. The marked effect that linguistic expectations can have on what we think we hear, so try avoiding this by doing practice transcriptions on tapes examples of language you do not know. Then one must attempt to take that frame of mind with you when you undertake clinical work. This last point is of particular importance for speech pathologists and clinical phoneticians, in that we need as accurate a record of the patients speech as possible, not simply the nearest phonemic equivalent. Without an accurate description we are unable to provide a meaningful diagnosis or prepare a helpful remediation plan. Any diacritics used should be clear, as it is easy to confuse some of them.
- All the symbols representing vowels, consonants (pulmonic and non- pulnmonic), suprasegemnts, diactritics, tones level and accents contour and other symbols are present in the IPA chart.
- Finally a set of additional symbols ie. Extended IPA symbols for atypical speech were provided in four major sections which can be used for variety of speech disorders to transcribe accurately. These have still to become widely known.
- Computer packages are also being developed to aid in the recognition of speech sounds, and so help in more accurate transcription. (Ball 1995).
- Leading the field in this regard is the computerized phonetics tutorial program designed to run on Kay Elemetrics computerized speech lab. This program

has stored the 1989 revision of the IPA, and symbols appear on the screen. SALT and PEPPER are two widely used and develop programmes in USA for clinical and research purpose.

- Nevertheless, we have spent some considerable space in introducing the phonetic symbols necessary to transcribe both normal and aspects of disordered speech. It is hoped that these few notes will guide you to the production of transcription of patients 'speech that will actually aid in diagnosis and remediation.

Exercises

1. Give IPA symbols for each of the following vowels.

a) high tense back rounded vowel
b) open (lax) mid front rounded
c) central mid unrounded
d) central low unrounded
e) high tense front rounded
f) high lax back rounded
g) mid lax front vowel
h) high back tense vowel

2. Give IPA symbols for each of the following consonants.

a) voiced uvular nasal stop
b) alveolar implosive stop
c) voiced retroflex lateral approximant
d) voiceless palatal fricative
e) voiced labiodentals nasal stop
f) voiceless bilabial unaspirated stop
g) voiceless dental fricative
h) alveolar trill
i) voiced velar nasal
j) voiced interdental fricative
k) voiceless affricate
l) palatal glide

3. Using the IPA chart give a description of the following symbols

a) [č]
b) [θ]
c) [ɛ]
d) [ə]
e) [ð]
f) [j]
g) [æ]
h) [~]
i) [*f*]
J) [ʌ]
k) [ʔ]

4. Transcribe the text below into IPA following your native accent as closely as you can.

a) When the sunlight strikes raindrops in the air they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

b) Jhony, Jhony, Yes PaPa……
Eating Sugar, No PaPa…….
Telling Lies, No Papa…….
Open Your Mouth, Ha…Ha…Ha……

c) A rich lady had adopted a poor orphan girl, who was very devoted, obedient, laborious, and always happy and kind.

One day the lady said to her: "Kamala, you are a good girl and therefore for Diwali, I shall buy some new clothes for you. I have already spoken to the shop-keeper about it. Here is the money; go and

buy the smart dress that you desire so much."

The lady gave her some money, but Kamala, considering the sum for a moment, said: "My dear mother, I have enough clothes for the present, while my sister Shanti is still poorly dressed and if she saw me with a new dress she would certainly feel a little sad. Will you allow me to send her the money? She is very fond of me and when I was ill she used to come to my beside and be the most loving nurse."

"My dear child," said the good lady, "write to your sister and tell her to come here and stay with us, and I will give the same to both of you. Since you both have the same love for each other, I shall do my best to keep both of you happy."

5. The following examples in broad IPA transcription contain errors.

a) /giv ðæt buk tu mI/ for 'give that book to me'

b) / ə lɛngwɛdz ækwaIzɛʃən præblɛm/ for 'a language acquisition problem'

c) / ðɛ ar rʌnIŋ fʌst/ for 'they are running fast'

d) / prəʃanəI Iz maI nɛm / for 'my name is prashanthi'

6. Transcribe the following IPA transcribed text into English.

[enək əwʌde pogəŋəm]

[ra:wile na:n a:rumʌŋikju ɛljunɛtju]

[ɛnde kajəl rʌndu pɛn ũdu]

[nja:n ra:wile bʌsəl a:ŋ vəna:d]

[ɛnikjə veŋunerəm pu:st po:kan ũd]

[ma:zə na:w malətI ahɛ]

[kʌl bənd həI]

[maɨ̯nɛ kʌl səbəko dawət pɛ bula:ja həI]

[papa a:dukuntundI]

[a:mI ba:dI za:bo]

[kəl t^h ɛkɛ durga pUdza ʃurU]

[a:dzə ro:bibar]

[ma:ka čəpat^{h}I dItna:]

7. Practice reading the following simple phonetic transcription. You should not have any difficulty, but if you do, try to analyze its source and nature.

a) [ðuvena] [uvena]

b) [ʌnəmu] [nəmu]

c) [ʌdəmu[[dəmu]

d) [četulu] [tulu]

e) [ˈuppu:] [pəpu]

f) [peɨ̯nu] [beɨ̯nu]

g) [ta:ləmu] [ta:mu]

h) [bəɬli] [piɬli]

i) [kuka] [n ʌka]

j) [sku:tər] [utər]

k) [kəɬera] [təɬera]

l) [pa:lu] [ba:lu]

m) [uŋrəmu] [boŋrəmu]

n) [ni:lu] [li:lu]

o) [pəndi] [bəndi]

p) [əka] [tʌmudu]

q) [kurči] [bəla]

r) [peɨ̯nu] [pencil]

s) [kuka] [koti:]

t) [kəɬu] [kaɬu]

u) [pərupu:] [mʌnčəmu:]

v) [fænu:] [laItu]

w) [bægu] [pərusu:]

x) [pletu:] [glasu:]

8. If we take away the orthographic conventions of spacing and pronunciation, you may find the transcriptions more difficult to read. Try these.

a) [ɛnikjəveŋunerəmpu:stpo:kanũd]

b) [həmsʌbsaəhəI]

c) [judjapasungənəptibʌsənarahɛ]

d) [babuʌnəmtintunadu]

e) [ka:ləmələta:phota]

9. Learn to read and to transcribe the consonant combinations. For each of the following find at least two words and transcribe them phonetically.

I.e. initial consonant combination followed by a vowel:

[pl pj br bl tr tw dr dw kr kl kw gr gl fl fr θr sp spr spl st str sk skr skw sw sl sm sn]

Final consonant combinations following a vowel:

[ps pt bz bd ts dz tʃt d d ks kt gd gz ft fs vz vd θs z d st sk sts sks sp zd ʃt mz md mp mps mpt nt nz ndz nts ntʃ ntʃt nd ndz ndzd Iz Id lts It Ip Idz Ik Im ŋz ŋk ŋkt ŋks ŋd rz rdz rm rk rt rts]

10. Match the following.

a) [ð] [high back close]

b) [u] [voiced velar nasal]

c) [t] [voiceless postalveolar fricative]

d) [z] [open cental]

e) [ŋ] [unvoiced retroflex plosive]

f) [I] [voiced dental fricative]

g) [θ] [voiced palatal fricative]

h) [a] [voiced alveolar fricative]

i) [ʃ] [high front close]

j) [j] [unvoiced dental fricative]

11. Write the phonetic symbol for the first sound in each of the following words, according to the way you pronounce it.

Example: psycho [s]

a) Judge -

b) Thomas -

c) Though -

d) Easy -

e) Pneumonia -

f) Thought -

g) Contact -

h) Phone -

i) Civilized -

j) Usual -

12. Write the phonetic symbol for the last sound in each of the following words.

a) Freeze -

b) Neigh -

c) Long -

d) Health -

e) Watch -

f) Cow -

g) Rough -

h) Cheese -

i) Bleached -

j) Boys -

k) symbolize –

13. Write the following words in phonetic transcription, according to your pronounciation.

Example: gnome [nõm]

a) Physics

b) Merry

c) Marry

d) Weather

e) Coat

f) Yellow

g) Tease

h) Heath

i) Catch

j) Pneumonia

14. In each of the following pairs of words, the bold italicized sounds differ by one or more phonetic properties (features). State the differences and, in addition, state what properties they have in common.

Example: ph***o***ne – ph***o***nic the ***o*** in *phone* is mid, tense, round.

The ***o*** in *phonic* is low, unrounded.

Both are back vowels.

a) ba***th*** – ba***th***e

b) redu***c***e – redu***c***tion

c) c***oo***l – c***o***ld

d) wi***f***e – wi***v***es

e) cat***s*** – dog***s***

f) i***m***polite - i***n***decent

15. A natural class is a group of sounds sharing one or more features in common. For each group of sounds listed below, there is one sound that does not share any phonetic features with all the others in the set. Indicate which sound is not a member of the natural class, and the phonetic features the other sounds in the class share.

Example: [p] [b] [s] [m] [v] [f] [s] all other sounds are labials except this.

[g] [p] [b] [d] [z] [v] ----------

[u] [i] [ɛ] [o] [e] ----------

[g] [k] [b] [d] [p] [v] [t] ----------

[a] [u] [e] [w] [i] [o] ----------

16. Below is a phonetic transcription of one of the verses in the poem O*ne Two. The* speaker who transcribed it may not have exactly the same pronunciation as you; there are many alternate correct versions. However, there is one major error in each line. The error may consist of an extra symbol, a missing symbol, or a wrong symbol in the word.

Write the word in which the error occurs in the *correct* phonetic transcription.

Corrected word

[vən tu bʌklə maI su] [ ]

[ɵri fo:r ʃət ðə dur] [ ]

[faIvə sIks pik ʌp ðə stIk] [ ]

[sɛvən ɛt lɛ ðɛm stərɛt] [ ]

[naI tɛn ə bIg fæt hɛn] [ ]

17. A phonetic symbol is a "cover term "for a composite of distinctive phonetic properties or features. Define each of the symbols below by marking + or – for each given feature, depending on whether the property is present or absent.

a)

	m	**l**	**θ**	**s**	**č**	**g**	**v**
Aspeirated							
Unvoiced							
Voiced							
Bilabial							
Dental							
Fricative							
Africative							
Plosive							
Nasal							
Lateral							
Alveolar							

b)

	a	**o**	**I**	**u**	**i**	**ɛ**	**æ**
High							
Low							
Back							
Tense							
Round							

18. Fill in the blanks.

a) Malayalam has varieties of -------- sounds.

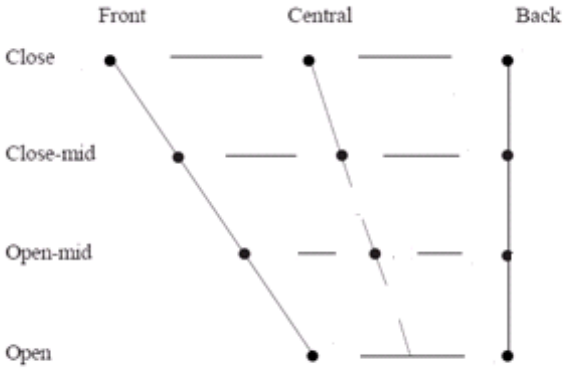
b) Aspiration can be denoted by the use of ----------.

c) ˚ when placed over indicated ----------.

d) Stress on the syllable in a word can be transcribed by using ----------before the syllable.

e) Extended IPA symbols can be used to transcribe ---------- speech.

19. Write appropriate IPA symbols for the cardinal vowel chart.



20. Choose the correct answer

1. International phonetic alphabet proposed by

   a) Indian phonetic association
   b) International phonemic association
   c) International phonetic association
   d) Indian Dravidian association

2. IPA was first proposed on

   a) 1996
   b) 1886
   c) 1986
   d) 1896

3. Which of the following is true regarding IPA

   a) Using more diacritic symbol in the table is appreciated
   b) If sound is in many languages different symbol has to be used
   c) Roman alphabets are given least importance in the table
   d) Separate letter for each distinctive sound

4. The major change employed in 1989 in the IPA table was

   a) Adding diacritic symbols
   b) Providing separate space for diacritic symbols
   c) Non pulmonic consonants were included in the same table
   d) Deleting few of vowel symbols

5. Who can use IPA

   a) Phoneticians,
   b) Speech and Language Pathologist
   c) Information Technology
   d) All of the above

6. Transcription that is considered least phonetic based are

   a) Phonemic transcriptions
   b) Narrow transcriptions
   c) Alphabetical transcriptions
   d) Romanic transcriptions

7. A person is reported to have unusual speech and voice, which of the following symbols are required to transcribe his speech precisely

   a) VoQS
   b) Ext IPA
   c) Suprasegmentals
   d) All of the above

8. This is insignificance in phonetic transcription

   a) Knowledge of language being transcribed
   b) Ignoring the influence of transcribers native language
   c) Gross mental segmentation of incoming signal
   d) Accurate perception

9. speech with velopharyngeal insufficiency or in competency is transcribed using

   a) Tonal symbols
   b) Ext IPA
   c) Non pulmonic
   d) None of the above
   e)

10. The vowel chart of IPA has folloing

a) primary cardinal vowel
b) Secondary vowel
c) Both a and b
d) Only b

21. True or False

1 IPA breaks the language barriers across countries. T F

2 Ext IPA is developed to transcribe disordered speech. T F

3	IPA symbols cannot be written using computers	T	F
4	IPA helps in comparing the sound system of two languages.	T	F
5	Tempo is a segmental feature	T	F
6	In American English of BANANA , the primary stress is possessed by the first syllable	T	F
7	A sample transcribed with stress , tonal raise/ fall patterns are called narrowly transcribed samples.	T	F
8	Diacritic symbols does apply to vowels	T	F
9	The most recent version of IPA is published on 2010	T	F
10	/: /, symbols if used after a vowel denotes centralization of that vowel.	T	F

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Manual – 4

Introduction to Speech-Language Disorders

Prathiba Karanth

Foreword

All India Institute of Speech and Hearing (AIISH) is a leading institute serving individuals with communication disorders in south Asia, established on 1965.The institute appreciates research in the field of Speech language sciences, speech language pathology and Audiology using the fund called AIISH Research Fund(ARF), raised from the beneficiary population of the institution.

Several research projects is being proposed in order to avail the fund for research purpose, one of them has resulted in development of this practical work book. Lack of manpower to transcribe existing speech language samples created a need to develop a kit to train eligible transcribers. Transcription of spoken language samples would serve as a huge data base of many speech language disorders that helps in clinical as well as research activity. Dr.K.S.Prema, Prof. of Language Pathology, Dept. of Speech-Language Sciences, AIISH, Mysore, initiated the idea to increase manpower generation in speech language transcription, by proposing a project through which curriculum was developed to train volunteers to transcribe speech language transcription. The name of the project is ñDevelopment and Evaluation of Curriculum for Speech Language Transcriptionò, numbered 3.46. The principal investigator has taken all possible inputs from an expertise phonetician, Prof.Peri Baskara Rao, Tokyo University of Foreign studies, where ever necessary.

Introduction to Communication Disorders is one of the theory course books for the curriculum The current manuscript is written by Dr. Prathiba Karanth, The COMDEALL Trust, Bangalore, who is well versed in speech language disorders. The book contains six chapters, each one of them focusing on different aspects of communication and its disorders.

Chapter I, Introduction to communication disorders aims to provide the reader with gross information about different types of communication disorders those is prevalent.

Chapter II, Terminologies and definitions focuses to provide the reader with knowledge of terms and definitions used in field of communication disorders

Chapter III, Speech and language development speaks about different aspects of speech and language those are essential fort normal communications and its development.

Chapter IV, gives information on speech and language disorders, where as Chapter V and VI speaks about speech and language disorders in solace.

Prof.K.S.Prema

Dept of Speech Language Pathology
Principal Investigator of the project

Contents

4.3 Classification

4.4 Intervention

5. Speech Disorders

5.1 Introduction

5.2 Voice disorders

5.3 Articulation Disorders

5.4 Fluency Disorders

6. Language Disorders

6.1 Introduction

6.2 Language disorders in children

6.2.1 Delayed Speech Language Acquisition

6.2.2 Developmental Language Disorders

6.2.3 Language disorders in other developmental disorders.

6.3 Acquired Language Disorders

6.3.1 The Aphasias

6.3.2 The Alexias and Agraphias

6.3.3 TBI

6.4.4 Right Hemisphere Syndrome

6.4.5 Dementias

Chapter I

Introduction to Communication Disorders

Communication refers to the ability of human beings to express our thoughts, feelings, as well as needs and desires. Simply stated, it is the exchange of information between and among individuals. The ability to communicate through verbal language considered the most important characteristic that separates human species from the rest of the animal kingdom. Communication can take place in many forms, in both verbal and nonverbal mode. The most common form of communication is through speech in the verbal mode, which consists of listening and speaking. Communication in the nonverbal mode may occur in many forms such as reading and writing, sign language, machine language as in Morse code as well as gestures and expressions. The two modes of communication, that is the verbal and nonverbal, are not mutually exclusive. They often occur together and complement each other.

Human beings are born with the necessary requisites for the acquisition of communication skills. However, the mastery of the many communication skills occurs in a gradual process that extends from early childhood through adulthood. Many of the core communication skills such as speech and language are mastered in early childhood. Learning to read and write and communicate through machine supported literacy such as using computers and the internet, come later. The acquisition of the varied communication skills is dependent on exposure, training and demand, and occurs from early childhood into adulthood. During this prolonged phase of mastery of communication skills, many factors, from biological to environmental can interfere with the acquisition of these crucial skills. When a child or adult has difficulty in communicating, it not only cuts them off from human society but also affects the individual in many ways. In a child it affects his/her cognitive and educational progress. In an adult it results in social and emotional isolation as well as loss of means of income.

Communication skills may also be disturbed, after having been acquired and used effectively for a prolonged period, in later life. Adults who have been competent communicators could lose their communication skills partially or totally consequent to disease, injury or other factors. Patients who suffer from diseases such as strokes and dementia lose their communication skills either gradually or abruptly. Cancer of the larynx could result in the larynx being surgically removed and a subsequent loss of voice production. Head injuries and psychological trauma can also interfere with communication skills.

The term “communication disorders” encompasses a wide variety of problems in hearing, speech and language. As of now they are restricted to communication through speech and writing. Individuals with communication disorders are unable to acquire understand and use the language of their society, appropriately. The overall estimate for communication disorders in school-aged children is widely agreed to be 5 to 10%. The incidence of communication disorders in the population at large, including adults is estimated at 10% or one out of every 10 people in countries like the United States. However there are no clear cut figures available till date for Indian population.

Traditionally, communication disorders have been grouped in to two main categories: the hearing disorders and the speech-language disorders. They need not however be mutually exclusive. Depending on the type and severity of

the hearing loss as also, the age at which it was acquired, hearing impairments can and do affect the acquisition and proper use of speech and language skills. , Speech and language disorders can be of a wide variety from a mild distortion of speech sounds to severe language deficits. In children they are often characterized as a delay versus a disorder. A child's communication is considered delayed when the child is noticeably behind his or her peers in the acquisition of speech and/or language skills. These delays are generally comprehensive delays affecting all aspects of language and the child appears to communicate like a child younger than his age. The term disorder on the other hand denotes that a specific aspect or aspects of speech and/or language are affected. Communication disorders can develop at any age. Communication disorders in adults may be those that they have grown up with or acquired subsequent to illness.

A communication disorder may affect any one or more aspects of communication. For instance while one individual may not be able to produce the speech sounds of his language correctly, another may not be able to speak fluently. A third may have difficulty in speaking loudly, while a fourth may have a difficulty only in reading. In other instances more than one aspect of an individual's communication skills may be affected. Such an individual may have difficulty in following directions or instructions, pronouncing words clearly and expressing himself clearly, in addition to difficulties in reading and writing. Similarly an individual's speech may become unclear after a facial palsy or he may be unable to understand his own language after a stroke or head injury, despite good hearing.

Many communication disorders in children result from conditions such as hearing impairment, cerebral palsy, mental retardation, or cleft lip and palate. Several speech and language disorders are related to these identifiable defects that the child is born with. Other communication disorders are consequent to injuries and ailments acquired after birth in childhood or in adulthood, such as head injuries, stroke, viral diseases, and prolonged use of certain drugs. Children who are developing normally may have their communication skills arrested consequent to head injuries and trauma or due to other illnesses such as meningitis, or even as a consequence of prolonged usage of life saving drugs prescribed for other life threatening diseases such as TB. Adults who are functioning normally can lose these abilities due to illness or old age.

A communication disorder need not necessarily be due to a biological factor alone. Disorders like the developmental language disorders and learning disabilities are believed to be due to biological causes, but there are no clear-cut physical signs of the same. Communication disorders may also occur in the absence of an organic or biological cause. For instance, excessive screaming and yelling over a long period of time can lead to voice disorders. Wrong speech and language models in the home environment may result in a child not picking up language skills at the right age. Environmental factors such as poor models may also result in poor articulation and lisping. While bi/multilingualism in itself seldom causes long lasting deficits in language acquisition, frequent and multiple changes in the child's early language environment can result in a delay in onset of language.

Frequently, however, the cause of a communication disorder, particularly in children is unknown. While the more severe communication disorders such as those consequent to mental retardation or deafness in children are relatively easily recognized in early childhood, the more

subtle language disorders such as developmental dyslexia or a specific reading difficulty is often not recognized even as the child struggles through school. Most of us are familiar with and can easily recognize children who are born with a biological deficit such as a hearing impairment or deafness, mental retardation or cerebral palsy and are aware that they do not develop like their normal peers and that a delay in speech-language acquisition is a common concomitant of these congenital defects. However, in the recent past an increasing number of young children are being identified with difficulties in the acquisition of communication skills, not caused by any of these better known factors or any other obvious biological factor. These are referred to as developmental language disorders (DLD) and are not easily identified. The acquired communication disorders such as those following surgery for a brain tumor or cancer of the larynx, on the other hand, are more easily recognized as they clearly occur subsequent to a medical episode.

During the last century, good communication skills have gained added importance in our society. So has the concern for individuals with communication disorders. It is in this context that the disciplines of speech-language pathology or speech-language therapy and audiology emerged, to cater to the needs of the many children and adults who suffered from a variety of communication disorders. The speech-language pathologist/therapist (SLP/SLT) is trained in the study of human communication and is specialized in the identification, evaluation, diagnosis and remediation of speech and language disorders in children and adults. The clinical methods used by the SLP, are dependent on the nature and severity of the problem as well as the age of the client. The audiologist is trained in the complementary skills of hearing and its assessment, as well as in the selection and fitting of suitable amplification devices such as hearing aids. SLPs and Audiologists or Speech and Hearing specialists work in close collaboration with medical professionals such as ENT surgeons, Pediatricians and Neurologists as well as with Educators, both special and regular, and with parents and families. They often work in hospital and clinical settings and at times in educational institutions.

This course book provides a basic introduction to the many aspects of speech and language skills, their acquisition and use in those with normal or typical communication skills as well as those with communication disorders.

Chapter 2

Terminologies and Definitions

Communication is a broad term that encompasses all forms of communication including the verbal and nonverbal. **Verbal communication** refers to the form of communication that all of us are most familiar with, that is communication through speech, and is often used to encompass a secondary mode, that is, the written mode too. **Nonverbal communication** can be of many different types including sign language, mechanical communication systems such as Morse codes and other communication systems such as those used by animals. Verbal communication has two major divisions – speech and language. **Speech** refers to the process of producing the sounds necessary for verbal communication that is physically making the sounds which form words for talking. Speech is further characterized by aspects such as voice, articulation and fluency. **Language** is the system that enables us to use words to communicate meaning, whether through speech or writing. The system that is used to convey meaning through signs is referred to as sign language. Language is further characterized in terms of phonology or sound patterns, lexicon or vocabulary and syntax or grammar. While speech is considered the primary mode of language, reading and writing are referred to as secondary modes of language.

Voice is what is heard when air from the lungs passes through the larynx causing vibration of the vocal folds. Voice is described in terms of pitch, loudness and quality. The perceived pitch of the human voice corresponds to the frequency at which the vocal folds vibrate.. Voice may also be described in terms of loudness and quality. Loudness is measured in units of sound measurement known as Decibels (dB). Loudness of the voice generally increases when the air pressure in the lung increases. The quality of the voice is determined by the frequency, loudness and resonance.. The tone of voice may also be modulated to express different emotions.

Articulation refers to the production of the speech sounds of a language by the coordinated movements of the vocal organs and passages –. The vocal organs consist of both air cavities and various articulators that are situated in the area from above the larynx upto the lips. The cavities are the pharyngeal cavity, oral cavity and the nasal cavity. The articulators are various portions of the tongue, the teeth, the lips, portions of palate, velum and uvula. The airstream that passes through the larynx enters into one or more of the above cavities and gets modified by the interaction of various articulators. All the above movements give rise to different kinds of resonances which are perceived as different types of speech sounds. Palate, teeth, tongue, jaw and lips that act in tandem to affect the passage of the air stream in various ways and at various points to produce the array of speech sounds that we use. By moving the articulators in specific ways to obstruct and constrict the airstream that emanates from the larynx, the articulators convert the sound that is produced by the larynx into consonants and vowels. These movements of the articulators in producing the different speech sounds are described as manner and place of articulation.

Fluency refers to the ease with which the words flow - one after another, without too many pauses, hesitations, repetitions and interjections and without disrupting the communication interaction. Fluency may be affected by many factors such as the competence in the language, as

well as the situation and individuals involved in the communication interaction.

Language has been traditionally described as having **vocabulary** and **grammar.** At the core of the study of language are the study of language structure (grammar) and the study of meaning (semantics). Linguistic terms such as phonology, syntax and semantics are used to describe the different aspects of language.

Phonology refers to the study of sound systems grouping related sounds into distinct classes called phonemes. Phonemes are the speech sounds of a language and are its smallest indivisible units. A phoneme in a language is a group of speech sounds that are pronounced in pre decided context. All the speech sounds that are grouped in a single phoneme are called the allophones of that phoneme. The allophones of a phoneme are the real speech sounds that are pronounced by a speaker of that language. Phonetics studies the physical properties of these speech sounds and is concerned with the actual properties of speech sounds which are known as phones and are described in terms of their distinctive features.

The study of meaning in language is referred to as semantics. Semantics deals with the study of meanings of words, phrases, sentences and other units of language. Semantics is the aspect of language function that relates to the acquisition of words, their meanings and their use in speech, both in isolation and as a part of phrases and sentences. It also covers the interrelatedness of words and the different manners in which words relate to each other. Other terms that are commonly used in semantics are lexicon and non lexical semantics.

Lexicon refers to the vocabulary or the word store of an individual in a given language. Non lexical semantics refers to the other areas of study in semantics such as the relations between different words such as synonymy and antonymy, or thematic roles and argument structure in texts, for instance. Semantics covers the interrelations of words and the different manners in which words relate to each other.

Grammar, the study of language structure consists of **morphology** and syntax – morphology encompasses the formation and composition of words while **syntax** covers the rules that determine how words combine into phrases and sentences.

Pragmatics is that aspect of language that covers those that use of language in social context. It refers to the use of language as well as the broader communication skills that are needed to interact appropriately with others in different social situations. It includes both verbal and nonverbal aspects of language in a social interactional context and the awareness and application of a set of rules that dictate our body posture, movement of limbs, proximity and eye contact when interacting with others. ‘ what to express, how to express and when to express his/her thoughts , conversational skills such as introducing a topic, taking turns at the conversation, maintaining a topic or signaling a change in topic and ending a conversation are some other components of pragmatics. In other words it can be said that the individual who knows all these has good pragmatic skills.

Two other terms that are increasingly used in the study of human language are paralinguistics and metalinguistics. **Paralinguistics** refers to the study of non verbal elements of human communication including intonation and body language. Paralinguistics are those aspects of language that are not expressed in the regular system of phonology, grammar and semantics (such as the intonation, voice quality

used in bored speech and excited speech etc.) **Metalinguistics** is the ability of an individual to consciously think about language and its use.

Indian languages and writing systems

The Indian languages belong to four language families - Indo-European, Dravidian, Austro Asiatic, and Sino-Tibetan. Indo-European and Dravidian languages are used by a majority of Indians .Dravidian languages in South India and Indo Aryan in the north, Tibeto Burman in the Himalayan belt as well as in the north east and Astro- Asiatic languages are used in the central belt as well as in Meghalaya. Despite belonging to different language families, the languages of India employ a common **writing system** - syllabic writing method where a unique shape is used for each syllable. It is believed that all of these scripts have been derived from Brahmi, the script used during Emperor Ashoka's time (300 BCE). Majority of scripts of Indian languages (irrespective of the families they belong to) are derived from a common ancestral script called Brahmi.A few Indian languages have Roman script or the modified Persio-Arabic.

Communication Disorders - when a person is unduly concerned about his speech and avoids communicating with others, or when speech is considerably different from that of others of the same age, sex, or ethnic group, or is hard to understand, a disorder may be suspected to be present. Communication disorders are broadly classified in to developmental and acquired disorders. A **developmental communication disorder** is one in which the child has difficulty in achieving any one or more aspects of communication on par with his peers during the developmental period. An **acquired communication disorder** is one in which the individual has acquired communication skills and had a period of normal communication usage, subsequent to which s(h)e has lost any one or more aspects of communication due to organic (biological), or functional (psychological or environmental) causes..

Communication disorders may also be classified in to **speech disorders** and language disorders. While some of the disorders affect speech or language exclusively, many affect both speech and language. Speech disorders involve difficulty with the act of speech production and may further be classified as a voice disorder (dysphonia), articulation disorder (misarticulation and dyspraxia) or fluency disorder (dysfluency).

Language disorders may affect **receptive language skills** or the understanding of language and **expressive language skills** or the production of language, either exclusively or together. When the overall language skills of an individual are on par with that of a younger individual it is referred to as **delayed language**. When any one or more aspects of language are not on par with that of peers and communication breaks down, then it is referred to as **disordered or deviant language**. The individual may experience difficulties in phonology, syntax or semantics in isolation or in combination of more than one linguistic aspect. Further Language disorders can affect any mode of communication such as both spoken, written language, and /or sign language.

Common speech disorders that are seen in children are the **voice disorders.** Puberphonia and androphonia are disorders of voice seen in adolescents in which the voice of boys sounds like that of girl's voice and vice versa. Disorders of voice such as hoarseness are common in children. Disorders of articulation, including lisping are also common in young children. In addition, there are children who fail to either develop the ability to

differentiate finer differences in speech sounds or produce those differences in their speech or both leading to disorders of articulation.

Stuttering is a fluency disorder, which disrupts the fluency of speech and is characterized by speech sound prolongations, blocks or interruptions to speech and sound, word and phrase repetitions. The term **'stammering'** is synonymous with stuttering. **Cluttering,** on the other hand is a fluency disorder, which is characterized by excessive speed of speech affecting speech intelligibility, also resulting in a communication breakdown. Fluency disorders such as stuttering and cluttering are seen in preschool and school children as well as in adults.

Developmental milestones including speech – language milestones are behaviors that emerge over time within a broad framework that is uniform across typically growing children irrespective of ethnic groups. The course of children's development is mapped using a chart of developmental milestones. When a child does not reach the communication milestones appropriate for his/her age and seems to lag far behind the typically growing children.of his age, he is described as having a delay in the acquisition of **speech-language**

Delay in speech language development may be caused by many factors including biological factors such as a hearing loss or mental retardation or environmental causes such as lack of speech stimulation. Some common conditions in which such delay may be seen are defined below.

Normal hearing is characterized by the ability to respond to sounds in the speech range, that is 500 to 4000Hz, at a loudness level of 0-15 dB in both ears. When a child requires the loudness level to be higher than this for the perception of sound and understanding speech he can be suspected of having a hearing loss. Those with hearing thresholds of greater than 25 dB till 70 dB of irreversible type can be referred to as being **Hearing Impaired(HI)**. Those with hearing thresholds of 90 dB or above, in both the ears are categorized as having severe or profound hearing loss and are often referred to as being deaf. When a child is hearing impaired or deaf, acquisition of speech and language is difficult or impossible without amplification and training.

Mental retardation (MR) refers to conditions in which children are slow in acquiring developmental skills, in most of the physical and mental functions, as compared to their peers. It can be caused by a variety of factors and ranges from mild to severe in degree. Definitions of mental retardation emphasize that it is not a disease but a condition which is characterized by 'significant limitations both in intellectual functioning and in adaptive behavior as expressed in conceptual, social, and practical adaptive skills' and that it begins in childhood. It is a developmental disability that is defined by intellectual functioning, generally as measured by standard tests of intelligence. Children with mental retardation function well below average intellectually, in comparison with their peers, and have significant limitations in daily living skills.

Cerebral Palsy (CP) is an umbrella term that refers to a subgroup of children with developmental disabilities that are characterized by disorders of movement and posture, which often persists across the life span of the individual. Children with cerebral palsy have non - progressive motor impairment that are often but not always associated with mental retardation. Lesions of the developing or immature brain cause

movement and postural disorders. In addition they often have other accompanying physical, behavioral, cognitive and communicative deficits.

Cleft lip and palate refers to a condition in which children are born with a slit in their lips or a hole in the palate (roof of the mouth). These structural abnormalities may result in delay in speech development , depending on their severity at birth and the age at which corrective surgery is undertaken.

Developmental Language Disorders (DLD) refers to children who in the absence of a clear biological cause such as MR or HI, and with adequate language exposure, do not acquire language as rapidly as their peers. Other terms such as **language learning disability (LLD)** have also been used to refer to this condition. In the past these children were referred to as having **'developmental dysphasia'.**

Specific Language Impairment (SLI) is a developmental language disorder in the absence of frank neurological, sensory-motor, non-verbal cognitive or social emotional deficits', or 'the term specific language impairment is used to describe children who have problems with the acquisition of spoken language despite normal nonverbal ability'.

Developmental dyslexia or specific reading disability is as the term denotes a specific difficulty in learning to read. It is often subsumed under the more general term **'Learning Disability (LD)'** which refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning or mathematical abilities. These disorders are intrinsic to the individual, presumed to be due to central nervous system dysfunction and may occur across the life span

Autism Spectrum Disorders (ASD) – refers to a disorder, in which children are generally indifferent to people and appear very aloof. These children make little eye contact with other people, have severe language deficits and show no desire to communicate with others, through speech or otherwise. Unlike their typically developing peers, these children also show little interest in imaginative or pretend play and instead react to their environment in unusual ways. **Pervasive Developmental Disorders (PDD)** is a broader term that was introduced in 1980 to refer to other children who share some of the features of autism but not all of those listed for the condition of Auism.

Pragmatic Deficits refers to deficits in the use of language in a functional context and are often known as **Asperger's** syndrome.It is a condition seen in high functioning children with autism characterized by comparatively better socialization skills compared to other pervasive developmental conditions in the continuum. Aspergers appear normal at least until one tries to really check his/her socialization skills.

Speech –language disorders may also be acquired after a period of being a competent speaker. Generally these acquired communication disorders are a consequence of injuries or illness and occasionally due to psychological trauma. Voice disorders may occur in later life due to constant misuse of the voice, referred to as vocal abuse or consequent to personal habits such as smoking and paan/tobacco chewing or it could occur in cases with organic causes such as cancer or injury to larynx causing vocal cord paralysis.

Dysarthria or difficulty in articulation of words can also be acquired consequent to injury to neurologic system related to orofacial muscles, tongue, lips, and throat. Similarly **neurogenic**

stuttering may be seen in adulthood consequent to neurological disorders.

Most communication disorders that are seen in adulthood are those related to brain damage such as strokes and head injuries or degenerative diseases that affect the brain as in the dementias. Combinations of speech and language disorders are seen in these patients along with cognitive disorders. However in some speech or language alone may be affected. The different terms that are used in relation to these communication disorders are defined below.

An **agnosia** is a loss of ability to recognize objects or symbols through a particular sensory channel (vision, hearing, touch, smell, taste), which cannot be accounted for by sensory deficits, impaired consciousness or unfamiliarity with the object. For example, a patient's inability to recognize the ring of a phone as indicative of a telephone call is a nonverbal auditory agnosia. An **apraxia** on the other hand is an inability to perform learnt motor movements voluntarily, in the absence of any motor deficit. These may affect the whole body or only the oral movements required for speech. Depending on the severity the latter is termed verbal dyspraxia or apraxia.

Paraphasia refers to disturbances in the verbal output of patients in which the utterances of patients include unintended syllables, words, or phrases during speech. Similar errors may be observed in written language. A **phonemic paraphasia** involves the substitution of letters in a word, for example, 'aminal' for 'animal'. **Semantic or verbal paraphasia** involves the substitution of one word for another, generally related to it in meaning as for example, . 'table' for 'chair'. When similar errors are seen in written language it is called as phonological paragraphia or semantic paragraphia respectively.

Aphasia or dysphasia refers to the full or partial loss of verbal communication skills due to brain damage that affects the language centers of the brain. Several types of dysphasia are identified based on which of the language functions are affected. When the aphasia primarily affects verbal comprehension or the understanding spoken language then it is named a **receptive aphasia**, when it primarily affects speech then it is termed as **expressive aphasia**. When the patient has difficulty only in naming or identifying items, then it is termed an **anomia** and when all aspects of verbal language are affected then it is called a **global aphasia**.

Alexia refers to the loss of the ability to read consequent to brain damage and is generally seen with aphasia. As in the aphasias, several subtypes of acquired dyslexia have been identified. Similarly **agraphia** is the inability to write or to express thoughts in writing because of a brain lesion.

Dysphagia is a difficulty in swallowing, commonly associated with disorders of the esophagus (food pipe). It may be caused by lesions in the mouth, pharynx, or larynx; neuromuscular disturbances; or mechanical obstruction of the esophagus.

In addition to the neurogenic communication disorders defined above, several new categories of acquired neurogenic communication disorders such as those due to traumatic brain injury or due to right hemisphere lesions and the dementias, are being delineated and defined. **Traumatic Brain Injury (TBI**) refers to an external injury of sufficient force to affect the normal functioning of the brain resulting in cognitive and communication impairments. It can occur in children or adults. **Right hemisphere syndrome** refers to the cognitive and communicative disturbances that are seen

subsequent to a lesion in the right hemisphere of the brain. The term **dementia** denotes a group of symptoms that characterize diseases and conditions that affect the brain, in which there is a steady decline in intellectual functioning along with memory disorders, changes in personality, deterioration in personal care and impaired reasoning ability with communication impairment.

Finally, it must be remembered that most of the definitions and descriptions of speech-language disorders, so far have been based on the monolingual populations most often from the Western countries such as USA and a few countries in Europe of the West. The population in countries like ours has a large number of people who are bi/multilingual, who can communicate in more than one language. The generic term used for multilingual persons is polyglot. This factor has to be taken into account in the definitions and descriptions of the communication disorders, as well as in the transliteration of the speech language samples when applied to bi/multilingual population.

Chapter 3

Speech and language development

3.1 Introduction

All children irrespective of culture, creed and race acquire their language (the language that is the home language that is heard in infancy) in a gradual fashion, spread over a few years, from birth or early infancy through the subsequent years. While more dramatic gains in speech-language acquisition occur in infancy and early childhood, it is now documented that the acquisition of the more complex aspects of speech, language and communication continue to be mastered well into adulthood. Different aspects of speech and language development however develop at different paces across different age periods.

3.2 Developmental changes in voice

The first milestone of normal speech is the birth cry. A delay in the birth cry could be an indicator that everything is not quite right and is an important indicator of whether the child is likely to have issues with health and development. The birth cry of the infant is the first use of his voice and indicates that the infant is alive and respiration has begun. A delay in the birth cry puts the infant at risk for normal health and development. The early vocalizations of the infant are now being studied more intensively for they are recognized as providing a wealth of information on the emotional state, neurological condition, language acquisition and environmental influence on the child.

The most common early cries of the infant are hunger cries. Gradually a distinction between comforts versus non-comfort sounds emerges. By six weeks the infant starts cooing and from eight weeks onwards infant vocalization takes on characteristics of pre-linguistic vocalization. Within 2-3 months the mother is able to distinguish the cries of her baby as being indicative of hunger versus discomfort, a stage known as differentiated crying. The infant also responds to adult attention by cooing. From 3 to 6 months the baby starts babbling, initially in a random fashion and gradually rhythmically. By 6-12 months the infant's vocalization is communicative. Babbling turns to imitative babbling, from which emerges the first word. By this time the baby's voice is also individual and personal or unique to him or her.

Of all the components of communication in humans, the voice is distinctively as personal and individualistic as one's finger prints. It is as much a part of our individuality as the facial features. No two human voices are the same. It would therefore not be an exaggeration to state there are as many distinct human voices as the number of human beings on the earth. However within this enormous range, human voices can be grouped into some categories such as young versus old, or male versus female based on some commonly accepted parameters. It is also true that while each of us retains a distinctive voice throughout our life span, each individual voice does undergo some changes through the different stages of life from infancy to old age.

The quality of the human voice changes across the life span and much of this is related to the changes in the fundamental frequency of the voice perceived by us as the pitch of the voice. The infant's voice shows a rapid increase in pitch or fundamental frequency from birth to about 5 months but it continues to decrease up to about 5 years.. The range of the voice remains more or less constant between 6 and 16 years. From the ages of 10 to 16 years along with the spurt in physical development, there is a sudden increase in the size of the larynx and the length of the vocal cords. Consequently voice drops in pitch. Additionally due to the larger resonator of the larynx, pharynx

and chest of the male, there appears a clear distinction between the male and female voice around puberty. Voice mutation and vocal pitch changes seen at adolescence are related to these biological/physiological changes.

Voice breaks and pitch changes occur frequently among both boys and girls during these adolescent years. Generally they are not very dramatic or conspicuous. In some cases voice breaks are sudden and involuntary changes in pitch and quality are seen. These vocal shifts are a normal physiological feature of juvenile laryngeal function and are due to poor coordination of the laryngeal musculature associated with body growth and stabilize within a short period. However they can be aggravated by vocal strain imposed by vocal abuse and result in voice disorders.

The voice of an adult remains more or less the same during adulthood, but with advanced age some changes may once again be seen. Some of the changes noted are a loss of projection and resonance – that is the ability to make oneself heard over large distances. Voice quality of older speakers is often affected by the effects of aging on the larynx and vocal tract. The vocal range may become restricted, particularly with the higher frequencies.

3.3 Development of articulation

Speech articulation is mastered by children in a gradual process from early infancy to the early school years. By 7 years of age most children master the accurate production of the speech sounds of their language. By and large mastery of articulation of the speech sounds follows a similar pattern across the languages of the world, depending on the phonemes that exist in each language. The vowels are acquired first, followed by the relatively easy bilabial consonants such as m/b/p. More complex consonants such as the other stop consonants (/t/,/d/), the laterals(/l/,/r/), sibilants (fricatives ,/s/,/f/). Finally, clusters of phonemes such as /sch/ as in 'school' and /tr/ as in 'train' are correctly acquired with development.

Sequences of speech sound acquisition as reported in some Western and Indian studies are given in the table below.

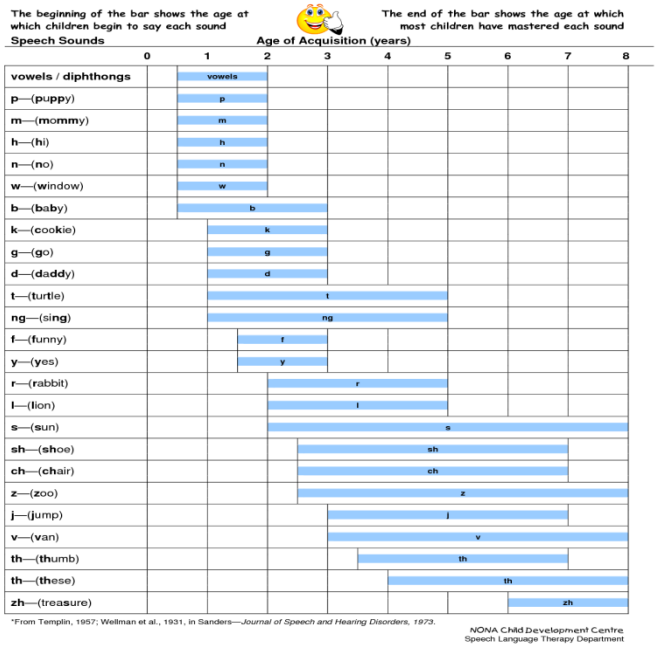


Table 1- Ages at which children acquire the different speech sounds.

As a rule, articulation once acquired is maintained over the life span. However there is evidence of articulatory imprecision in the speech of older adults which are attributed to reduction in flexibility of fine motor control and spatiotemporal stability of the articulators.

3.4 Development of fluency

When children begin to speak around 1 -2 years, their speech is very hesitant with long

pauses. From the age of 2 years the child's speech becomes more and more fluent.

Development of fluency in speech is parallel to development in speech and language acquisition as well as cognitive development. The hesitations and pauses (disfluencies) that are present in infancy reduce over time. At the age of 2 years the child tends to repeat small speech units such as syllables, interjects speech output with exclamations, or revises his utterances. However, over the next 2-3 years there is a marked reduction of these repetitions. Between the ages of 3-5 years the child's speech will still be characterized by frequent pauses, during which the child continues to vocalize syllables such as 'hmmm'. These filled pauses often occur before content words or nouns. As children get older the duration of their unfilled or silent pauses that lead to disfluent nature of speech reduce rapidly in early school years and then more gradually during the rest of the school years.

Factors such as continuity of speech, rate of speech, effort, rhythm and other physiological factors such as coordination and timing in speech, affect the fluency of a child. Other factors such as the linguistic maturity of the child and the complexity of the utterances, particularly grammatical complexity also influence fluency at a given time. As a rule, girls are more fluent than boys, particularly during the early developmental stages. In addition other situational or environmental factors such as whom the child is talking to and where, also has an effect on the fluency of the child.

Fluency of speech once acquired is generally maintained across adulthood. However speech fluency can vary according to situations. As a rule it is the best when speaking in small groups of known individuals during casual exchange or while conversing on topics well known.. Fluency can be affected when speaking to large number of people, speaking under stress or when emotionally charged or when speaking to authorities often to speakers of the opposite sex.

3.5 Development of language

Children acquire language rapidly in childhood, with very little direct assistance or teaching from adults and this is universally so. This capacity of children to acquire language and the common features across all human languages is generally believed to depend on biological systems. The child's ability to acquire language is therefore seen to be dependent upon neural systems that are genetically influenced.

Language development is considered to have begun when a child starts using his first words. Normally a child will learn to say one or two words intentionally with reference to specific objects or people, by the age of one year. Most children begin to acquire their vocabulary by the time they are 12 to 18 months old. By 18 months of age the child will expand his vocabulary to about 20 words. Vocabulary is built up gradually between the ages of 1 and 2 years, and then witnesses a massive growth spurt. Not only does the child build his vocabulary (or lexicon) but he also masters the relationships between words and word categories, such as opposites and plurals etc., thus building a semantic network. By the time they are two years old, children have a vocabulary of about 50 words. By six years children are reported to have a vocabulary of about 4,000 to 5,000 word families going up to 20,000 by young adulthood and expanding gradually after that, depending on the individual circumstances. It is now documented that considerable expansion of vocabulary continues to occur in adulthood

depending on the individual's use of language for professional purposes.

Apart from building his vocabulary, the child also acquires mastery over the syntax or grammar of language in early childhood. By 18-24 months the child begins to make rudimentary sentences by combining two words into simple two word phrases and over the next year starts using short phrases of 2-3 words. By three years they begin mastering syntax or the rules that dictate how words are to be combined in to sentences. Between three and five years of age there is a rapid increase in both their vocabulary and their command over syntax. Between the ages of 3 – 7 years (s/he) masters much of the grammar of her/his language and starts making adult like sentences with appropriate use of tense, person, noun and gender markers as well as more complex sentences including propositions and a variety of clauses. These are also the years for emergence of questions such as – what, where, who, why and how.

By five years, children are capable of telling simple stories. As they get older they master complex aspects of language use such as narration and storytelling, Gathering and providing information, narrating incidents and increasingly becoming proficient in the social and information seeking functions of language emerges in the course of time. Mastery of the finer aspects of language such as its use in different contexts, for different social purposes, or the use of refined syntax for purposes of precise information exchange (as in academic exercises and discourse), or the subtle play of language in humor and puns are gradually built over adolescence and adulthood. The acquisition of the advanced language skills by adolescents in the age range of 13-18 years, consist of increasingly precise use of the lexicon, use of figurative language such as idioms and puns and peer group slang, the increasing use of complex passive and embedded sentences and the ability to grasp overall meanings of narratives. Good conversational skills with the ability to choose the correct register in social conversations are also increasingly mastered during these years.

Pragmatic skills or the acquisition of the rules that underlie the use of language that is appropriate to social context also starts developing early in life. Though the early turn taking exchanges between mother and infant may be more nonverbal than verbal, they lay the foundation for later verbal exchanges and development of pragmatic skills. More complex aspects of pragmatic skills are acquired through infancy and the early school years culminating in the most complex use of pragmatic skills, as seen in conversational skills and social use of language in adolescence and adulthood.

Like all other communication skills language skills are also known to be affected in old age. Some of the more prominent difficulties are rapid access to the lexicon which manifests as word finding difficulties. Geriatric subjects are also noted to be repetitive in their communication. It is also observed that they find it difficult to recall words quickly and fail to understand complex sentence structures owing to slow decline in cognitive abilities with aging.

It is important to emphasize that all of these aspects of speech and language are acquired in parallel and vary according to the age of the speaker. Awareness of and familiarity with these life span changes are important during transliteration and interpretation of speech samples. The description of a sample and its acceptability can only be made vis a vis the normal expectations for the given individual, in terms of age, sex, linguistic and cultural background. Professionals

involved in transliteration work need to be sensitive to these changes as age is an important criterion in determination of normalcy.

It must also be noted that much of the information provided above has been documented in monolingual speakers on whom this type of research has taken its root. Not much has been documented as yet about the proficiencies of speakers from bi and multilingual backgrounds such as India. . Considerable interest is now being evinced in these areas and it is likely that our understanding of the acquisition and maintenance of communication skills in humans will be further enriched by newer findings. In the meanwhile decisions about 'normalcy' have to be taken within the context of the language background of a given individual and the language in which the sample was drawn. When describing and deciding whether there is a communication disorder, samples and assessments should be from the most proficient language of the individual and the influence of additional languages if any, that the individual is exposed to ought to be considered in arriving at a decision of the existence of a disorder.

Chapter 4

Speech and Language Disorders

4.1 Introduction

Human verbal communication constitutes two major components , the production, transmission and perception of speech sounds and the knowledge and application of a set of rules that governs them, that is the rules of the particular language that they speak. Speech is the spoken medium of language. The term "speech" refers to the process of producing the sounds necessary for verbal communication. This process of speech sound production begins with an activation of a stream of air from the lungs. The vocal cords act on this stream of air by vibrating while it flows through them, and then on to the resonating chambers of the mouth and nose. While it flows through these resonating chambers it is further acted upon by other vocal organs such as the tongue, jaw and lips to produce a distinct set of sounds, which are the speech sounds of a particular language. These speech sounds are perceived as a series of acoustic events by the listener's ears, which in turn, are passed on to the higher centers in the brain where they are perceived and identified as a set of speech sounds, that make up meaningful words and sentences.

As seen in the previous chapter children acquire and master different aspects of speech and language at different times in childhood. When a child does not master speech in all its aspects at the right age, s/he is considered to have delay in the acquisition of speech-language (DSLA) child with DSL will communicate like a younger child with all aspects of speech and language being similar to a younger child. Other children will have a delay or a difficulty in any one or more aspects of speech and language, with some aspects of speech and language being appropriate to their age. These children are considered to have developmental speech and language disorders.

In older children and adults when a person is unduly concerned about his speech and avoids communicating with others, or when speech is considerably different from that of others of the same age, sex, or ethnic group, or is hard to understand, a disorder may be suspected to be present. A speech problem can be mild, moderate, or severe. Speech and language are composites of several factors and have different aspects, which may be selectively affected. Speech for instance has at least three major aspects, those of voice, articulation and fluency. Similarly language has aspects such as phonology, syntax and semantics. In addition, there are the social rules of language use or pragmatic skills that a child has to learn and use appropriately to be an effective communicator. It is important to remember that a child could have difficulty in acquiring any one or more aspects of speech and language. However since all of these aspects of verbal communication act in tandem in every speech act, a disorder in any one or more of these aspects will affect communication as a whole.

Speech and language disorders may also be seen in adulthood. Individuals who were good verbal communicators for several years may lose their communication skills consequent to injury, illness or old age. The injuries and illnesses that commonly cause speech – language disorders in adults are head injuries, strokes, and other degenerative disorders such as dementia. Old age can also affect speech-language skills. These communication disorders are often referred to as the acquired speech language disorders.

Acquisition of reading and writing, which are considered a secondary mode of communication, may also be affected in a child or lost in an adult. These disorders of reading and

writing are also included within the purview of communication disorders.

4.2 Description

Apart from the distinction of developmental versus acquired communication disorders, referred to above, speech-language disorders are also divided in to four broad areas of disorders depending on the particular aspect of speech that is disordered. Hence there are voice, articulation, fluency and language disorders. Further these four subtypes are divided in two additional subtypes. While some children and adults may have a single aspect of their communication impaired, others may have two or more aspects of communication impairment. At any given time a particular child may have a number of inter-related communication disorders. For instance a child with a language disorder may have a difficulty specific to reading alone. In contrast a child with cerebral palsy may have multiple communication disorders including voice, articulation, fluency and language disorders. Similarly a stutterer or stammerer may have only a fluency disorder whereas an aphasic may have difficulties in articulation and language subsequent to a stroke.

At times the smooth production of voice is interfered with due to some abnormalities in the movements of the vocal cords. When the quality, pitch and loudness of a voice differs significantly from that which is customary in the voices of others of the same age and sex, it is classified as deviant or defective and described as a voice disorder. The impact of the listener's experience and background are factors that play in to this process.

The term voice disorder also refers to problems with the pitch, volume or quality of the voice. When the volume of speech is too high or low or when there is an unpleasant hoarse/harsh or nasal quality to the voice, then a voice disorder is said to be present.

Voice disorders are seen frequently in children and are generally found to be higher among boys as compared to girls. The causes and types may vary at different ages. In younger children aged six to ten years voice disorders are often caused by vocal abuse or misuse, whereas around puberty they are related to the structural changes that occur in the body. Voice disorders are characterized by abnormal vocal pitch, loudness, quality or resonance. The pitch may be too high or low or monotonous (that is flat pitch). When the pitch of a boy's voice is too high he sounds like a girl. On the other hand when the pitch of a girl's voice is too low she will sound like a boy. It may also be too loud or too soft. The overall quality may be poor, sounding harsh, hoarse, breathy or nasal. Unless the disorder is chronic they can be corrected within relatively short periods of intervention**.** The prevalence of voice disorders is reported to decrease in post pubertal children.

Voice disorders may also be acquired in adulthood. These are often consequent to injuries and illnesses such as vocal cord paralysis, or the growth of vocal nodules and/ or tumors. They may also be due to surgery for treatment of cancer of the throat in which the larynx is surgically removed.. They learn to produce voice through alternate means such as voice prostheses, esophageal speech or through the use of external devices such as an electro larynx.

Cleft lip and palate are another category of anomalies with which some children are born. Cleft lip, also known as 'hare lip' refers to a condition in which a child is born with a cleft or a cut in his lip, usually the upper lip. This could be on one side of the lip or on both sides. Often the cleft extends backwards into the palate or roof of

the mouth and occasionally all the way to the soft palate, with a missing uvula. Here too it could be on one side alone or restricted to either the hard or soft palate, or be extensive including both the hard and soft palates. Clefts known as sub mucous clefts, which are not visible to the untrained eye may also be present. Often there is a nasal quality to their speech, which is caused by the inadequate closure of the oral from the nasal cavities, a consequence of the cleft palate.

We speak by making a series of speech sounds that are combined into certain patterns that make words. The speech sounds of a language are not produced a hundred percent identically by all speakers of that language. Yet for speech to be acceptable and understood there should be enough similarities that each time a speech sound is produced by a speaker, all speakers of that language are able to identify it as representing that particular sound. Children learn this process of replicating the speech sounds of their language over a period of a few years, in early childhood. When a child does not produce the speech sounds of his language appropriately like his age matched peers an articulation disorder may be present.

Some children lag behind their peers in the correct production of the speech sounds of their language. These children generally acquire the speech sounds of their language in the same hierarchical manner as others but there is a considerable overall delay in terms of age of acquisition. Other children may produce their speech sounds at the right age but do so incorrectly. The incorrect production of the speech sounds is often related to structural abnormalities of the articulators or organs involved in speech production, such as the tongue, lips and jaw. These structural abnormalities when present result in restricted or uncoordinated movements of the articulators. For accurate speech production the articulators not only have to move rapidly but also in a well coordinated manner. When speech sounds are produced in a deviant manner because of structural abnormalities such as those associated with orofacial abnormalities like cleft lip, tongue tie, or misaligned teeth or dental malocclusion, they are termed as articulation disorders. In motor coordination disorders such as cerebral palsy, dyspraxia and dysarthrias, articulation is affected because of lack of coordinated movements of the articulators. In addition to structural abnormalities, faulty learning resulting from encouraging or rewarding immature productions as in lisping and poor speech models in the environments may also lead to articulation disorders. Articulation delay may catch up with correct production. A child with a structural abnormality or a motor coordination disorder will require proper and sustained professional intervention to overcome misarticulations. Articulation disorders may also be seen in adults' consequent to cerebral insult in conditions such as head injuries and strokes. They are referred to as dysarthria, apraxia or paraphasias depending on the nature of the articulation disorder.

The term fluency in speech refers to the smooth, effortless, uninterrupted flow of an utterance. When the smooth, forward flow of speech of a given speaker is disrupted by frequent pauses, hesitations, interjections, prolongations and repetitions, to such an extent that it attracts attention to itself rather than to what is being said, then a dysfluency or a fluency disorder could be present. The most common fluency disorder is called stuttering or stammering. However other types of fluency disorders such as cluttering and neurogenic stuttering also exist.

During the period of speech-language acquisition in early childhood, i.e., from the ages

of 2 to 7 years, children often have difficulty in speaking and tend to hesitate or repeat some syllables, words or phrases. These are periods of 'normal disfluency' that most children experience as they learn to speak. These disfluencies occur most often between the ages of two and five years and they tend to come and go, over several weeks, as the child goes through stages of language learning and then they gradually decrease. However in some children these disfluencies which initially vary from day to day or situation to situation continue to persist and increase, eventually to attract the label of stuttering or stammering.

Fluency disorders such as stuttering are characterized by multiple repetitions of a syllable as in 'pa pa pa paper' or prolongations of a single sound like 'ssssspeech or abnormal stoppages in speech with no production of sound. These individuals often have abnormal facial and body movements such as eye blinks, head nods and tensing of the neck muscles associated with their speech difficulties. When the person repeats words frequently, i.e., again and again in the same utterance, or pauses too frequently and for too long it may interfere in communication. Listener reactions are good indicators of whether an individual has stuttering. In other words that is an individual may be labeled a stutterer when the listener's attention is frequently drawn to the manner of speech rather than its content.

The onset of dysfluency or stuttering in adulthood is relatively rare. However they are known to occur occasionally, most often subsequent to a neurological disorder and are referred to as neurogenic stuttering since the speech characteristics are similar to that of stuttering. Unlike stuttering of developmental origin neurogenic stuttering tends to be present all the time, irrespective of the speaking environment and listener.

The majority of communication disorders are language disorders both in children and adults. In children there may be an overall delay in language acquisition caused by biological factors such as a hearing loss or mental retardation or due to other psychological or environmental causes such as lack of adequate exposure to language or even its converse, that is too much exposure to too many languages. Language disorders may also be seen in a range of childhood disorders and syndromes such as the Autism Spectrum Disorders or Down syndrome. Some children have specific difficulty in acquiring language in the absence of any known or identifiable medical/neurological or psychological cause and are referred to as having developmental language disorders. Children, having acquired language may also lose it subsequent to head injuries, convulsions, psychological trauma or infectious diseases such as meningitis and encephalitis. They often affect both spoken language and written language, if the child is literate.

The language disorders seen in adults are most often acquired consequent to injury or damage to the brain from a variety of causes such as strokes, head injuries, brain surgery or degenerative diseases. They may occur at any age and affect both spoken and written language skills in different combinations and to different extents depending on the severity of the underlying cause. These language disorders are often severe enough to disrupt the individual's life and persist over a long time.

4.3 Classification

A common dichotomy is that of Speech versus Language disorders. Speech disorders are

those in which the correct production of speech sounds are affected rendering the speech unintelligible as well as those which affect the quality of the voice and the smooth flow of speech. Language disorders are those which affect the ability to understand instructions, directions, and stories as well as to string words together to make sentences, to participate in conversations, to read and to write. Several classification systems are used to group communication disorders. Some of the broader classification systems are:

a) Hearing disorders, speech disorders and language disorders focus on the broad area of the disorder, though there are often overlaps among the three.

b) Others have described them as the **organic versus functional**, depending on whether a clear organic or biological factor can be associated with the communication disorder.

c) Another broad classification is that of **developmental versus acquired** disorder depending on when the communication disorder occurred.

d)Some classificationsystem focuses on the **cause of the communication disorder** as in cerebral palsy or aphasia and these are generally based on medical models.

Current classification of speech-language disorders identify four broad areas, that of articulation, voice, fluency and language depending on the aspect of verbal communication that is disturbed. Accordingly we have the

a) articulation disorders,

b) fluency disorders,

c) voice disorders and

d) language disorders.

While each of these aspects are described individually, two or more aspects of speech may be affected in the same child. Speech disorders associated with specific conditions such as cleft palate, cerebral palsy, cranio-facial anomalies, hearing impairment, pediatric stroke, traumatic brain injury (TBI), Down syndrome, and other syndromes and developmental disabilities, often have more than one of these components affected.

4.4 Intervention

An intervention program for a child with a communication disorder is generally preceded by extensive evaluations to identify the source of the communication difficulties. The assessment and management of communication disorders in children requires the cooperation of several specialists apart from the speech and hearing specialist. Among the medical personnel, pediatricians, ENT surgeons, neurologists and child psychiatrists are those that are often required to be consulted. Where necessary and feasible this is followed by medical intervention through appropriate referrals. For several communication disorders medical intervention is not an option. The SLP then provides intervention directly. In addition SLPs also work closely with psychologists, special educators and classroom teachers in the assessment and management procedures.

Speech-language therapy is directed at improving the communication skills of the individual to the extent possible. There are no ‘cures’ for many communication problems. However children are taught to use new effective strategies to ameliorate and overcome their difficulties. The treatment procedures for communication disorders are varied and specific to the type of problem faced by a given individual at a given moment. It could vary from the correction of a single speech sound to providing a nonverbal

means of communication and training the individual in its use if the physical conditions of the child make verbal speech impossible or extremely difficult. Electronic communication devices can be provided to nonverbal children and adults so as to enable them to participate in academic, professional and social lives to the extent possible, despite their disability. Speech-language therapy is generally provided in one on one individual session and at times in group sessions, twice or thrice a week, in clinical settings followed by counseling and guidance to parents and caregivers for home based follow up activities for long- term outcome.

Chapter 5
Speech Disorders

5.1 Introduction

As seen in the previous chapter Speech Disorders are those in which the speech of an individual, child or adult, does not match those of his or her peers or attracts so much attention to itself that it interferes with communication. These speech disorders are broadly classified in to Voice, Articulation and Fluency disorders depending on the particular aspect of speech that is affected. At times more than one aspect of speech may be disturbed in the same individual. In this chapter each of these groups of speech disorders, their subtypes and their characteristics are described in greater detail.

5.2 Voice Disorders

Good respiratory patterns and fine coordination of the movements of the thoracic and abdominal muscles are important for the production and maintenance of a good speaking voice. Any interference in this procedure could affect the quality of voice production and lead to a voice disorder or dysphonia.

Voice disorders are characterized by abnormal vocal pitch, loudness, quality or resonance. The pitch may be too high or low or monotonous. The voice may be too loud or too soft. The overall quality may be poor, sounding harsh, hoarse, breathy or nasal.

Children suffering from voice disorders often display a hoarse, raspy vocal quality and may have difficulty varying the volume of their voice and these are commonly referred to with descriptive terms such as "hoarseness", "raspy voice", and "weak and breathy voice". Often this is a result of overuse of their voice or talking too loudly. This phenomenon termed 'vocal abuse' is the result of excessive screaming, frequent coughing or throat clearing, or speaking at an uncomfortable pitch. When this behavior persists for a prolonged duration physiological changes such as vocal ulcers thickening of the vocal folds can occur eventually leading to vocal nodules.

The majority of young children with voice problems are found to have vocal nodules consequent to vocal abuse. In a smaller percentage this could be due to chronic laryngitis. Allergies resulting in frequent coughing and throat clearing, as well as mouth breathing resulting in drying out of the vocal folds may also lead to voice disorders. Acute dysphonia or sudden and total loss of voice is often caused by acute respiratory infection, which exacerbates chronic laryngitis.

Some children may be born with other kinds of vocal pathologies such as vocal fold web or inflammation of the vocal cords due to reflux disorders. Other conditions such as a hearing loss or a cleft palate may also contribute to a voice disorder. Children with a hearing impairment and poor auditory discrimination often tend to speak too loudly to compensate for these difficulties resulting in a strain on their voice. Similarly children with cleft palates and poor articulation and resonance may raise their voices to reduce nasality and achieve greater speech clarity, but affecting their voice in the process. Nasal obstructions such as in children with deviated nasal septum or damage to the larynx as a result of injuries and accidents can also lead to a voice disorder. Children with neurological conditions such as cerebral palsy and endocrinological disorders such as myxoedema often have consequent voice disorders. Among the most common causes of voice disorders in children, however are laryngitis, both acute and chronic.

Another type of voice disorder often seen in children, particularly in males is those that are

related to the structural changes in the larynx that occur around puberty. While these changes take place in both boys and girls they are much more marked in the former. During the occurrence of these changes in the size and volume of the vocal cords the pitch drops considerably. The transition phase is often accompanied by pitch breaks with perceptible changes occurring frequently, at times even within the production of a single utterance. Boys, who are unable to make this transition smoothly, often persist in the use of their pre-pubertal voice resulting in a condition known as puberphonia. In lay terms this refers to making him sound like a female. In contrast some girls adopt a pitch that is too low for their gender – a condition that makes them sound like boys and is known as androphonia.

It is important to remember that an isolated voice disorder may also be the result of more than one contributory factor and that these factors often blend and interweave in the causation and maintenance of a voice disorder. Most of the dysphonias or voice disorders seen in children can be treated successfully, particularly if identified early and provided with intervention.

Voice disorders can occur at any time in the lifespan of an individual. Individuals, whose professions require that they use their voice throughout the day, such as teachers, are particularly at risk for voice disorders. So are others like professional singers, DJs and commentators. It is important that these professionals follow strict regimes of vocal hygiene in order to maintain their voices.

Personal habits such as smoking and chewing of tobacco can also result in the vocal cords being affected leading to voice disorders. In extreme cases it might lead to laryngectomy or the removal of the vocal cords as in cancer of the larynx, resulting in a total loss of voice. These patients are subsequently trained in the use of alaryngeal speech with or without the aid of mechanical devices.

Vocal cord paralysis is yet another cause of dysphonia or voice disorders in adults. Vocal fold paralysis or immobility is more common in adults and are seldom seen in children. With the movement of the paralyzed vocal cord the voice tends to get breathy and hoarse. Degenerative diseases in adults like Parkinsonism too can affect the smooth movement of the vocal cords and result in a lack of control over the production of voice making the voice tremulous and unsteady with frequent uncontrolled changes in pitch and loudness.

5.3 Articulation Disorders

Articulatory errors can be due to a developmental delay or a disorder. When a child's articulation development is below his chronological age (CA) and he fails to acquire the adult articulatory pattern for the phonemes of his language, at about the same age as his peers, then it is termed as an articulatory delay. It may also be termed as an articulatory immaturity. The child often overcomes these articulatory delays with maturity and/or therapy.

Many children have consistent and persistent difficulties in producing some speech sounds that are not in consonance with a straightforward delay. These speech errors, which are caused by a variety of factors, are called articulation disorders. When a child fails to produce a speech sound correctly because s/he cannot place the articulators in the specific position required for the production of the targeted speech sound it results in a 'misarticulation'. Misarticulations are often characterized as substitutions, omission, distortions and additions (SODA). Some children with an articulation disorder use an easier speech sound for a more

difficult one as in /lolly/ for /lorry/ (substitution), drop some speech sounds from a word, as in /coe/ for /crow/ (omission), produce the correct sound, but in such an effortful manner that the sound is unrecognizable (distortion) or add extra speech sound to a word such as in /animamal / for animal (addition). Others may mix up the sequence of speech sounds in a word as in /efalant/ for /elephant/. Often the misarticulating child has a few such errors but will make these errors consistently, despite correction. The child often knows the correct target sound but has difficulty in producing the necessary articulatory movements, for the correct production of the target sound. As a result generally the production of the word though not accurate is generally intelligible.

Misarticulations may be due to organic causes such as a 'tongue tie' where the movements of the tongue are restricted or consequent to hearing loss because the child does not perceive the sound properly. Inadequate movement of the articulators such as the movement of the lips in a child with a cleft lip due to poor coordination as in the dysarthrias. Dysarthrias, while more common in adults, can be seen in children too and are generally consequent to neurological disorders. The movements of the articulators are affected and the child is unable to make the rapid and well coordinated movements for speech as a result of which speech becomes unintelligible.

Among the organic causes of an articulation disorder is a developmental or verbal dyspraxia. The term refers to a condition in which children have difficulty in producing the necessary well coordinated movements of the articulators when required to do so, in the absence of any visible motor coordination issue. These children often produce these movements and well articulated words spontaneously on their own, but are unable to do so on demand. Unlike the child with a dysarthrias there are instances when the child spontaneously produces good articulation. Eventually, with repeated failure at conscious articulation his/her speech becomes distorted and unintelligible.

Misarticulation can also be due to environmental causes such as deliberate encouragement of 'baby talk' in the home or because the child has poor speech models. It must be noted that at times, depending on the speech community that a particular child comes from he may use a form of articulation that is different from the standard, for e.g. an Urdu or Hindi speaking child saying /iskool/ is acceptable within that community, since in Urdu and Hindi, words do not begin with the cluster /sk/ and the speaker is following the phonological rules of his language in adding the 'i' in producing /iskool/. However, the same would be considered a misarticulation if the child was speaking English. These articulatory patterns which are due to the cultural or ethnic background of the child should not be categorized as a disorder. In the identification and evaluation of articulatory patterns it is therefore important to take into consideration the cultural or ethnic background of the child.

Articulation disorders when acquired in adulthood are generally the result of injury or illness. Any injury that interferes with the smooth functioning of the articulators, disrupting the fine coordinated movements required for clear speech affects articulation. Neurological illnesses in adulthood such as facial palsy, strokes, head injuries and other neurogenic disorders also result in poor articulation. While the dysarthrias are seen as more 'peripheral disorders' since they do not affect other aspects of communication the poor speech output that is seen in patients with more 'central cortical disorders' such as the dysphasias

are termed paraphasias and will be described along with language disorders.

5.4 Fluency Disorders

When the disfluencies of a child persist beyond the early stages of language acquisition and increase in frequency and severity to such an extent that they draw attention to themselves and cause concern among parents, it can be the beginning of a fluency disorder such as stuttering. The onset of the disfluency is usually insidious, beginning with repetitious speech which is common at this age. It is generally episodic at first varying from day to day and situation to situation. Very few report a sudden onset of disfluency. About 3-5% of preschool to school age children will continue to exhibit stuttering like characteristics in their speech and about 1% of these children will continue to have a long term fluency disorder. Stuttering, or stammering as it is also known, is a fluency disorder, which disrupts the fluency of speech and is characterized by speech sound prolongations, blocks or interruptions to speech and sound, word and phrase repetitions, for example as in, ‘ ssssame’, ‘tuh-tuh-tuh-table’, ‘good..good.good morning’.

By definition, fluency disorders are a group of speech disorders in which there is an interruption in the flow or rhythm of speech characterized by hesitations, repetitions, or prolongations of nouns, syllables, words or phrases. Among the fluency disorders stammering or stuttering is the most common. Stuttering develops in early childhood, persists into adolescence, often exacerbating during this time and continues into adulthood. In some individuals stuttering may spontaneously disappear by adolescence and adulthood. Even when it does persist the severity generally reduces in adulthood. Apart from the frequent repetitions, hesitations and excessively long pauses and prolongations that are characteristic of early childhood stuttering, secondary characteristics such as facial grimacing, arm or hand movements, at the time of stuttering often develop in school age or older children. The child may now begin to avoid some words and speaking situations.

The severity of stuttering varies in a given individual across speaking situations, from day to day and across the life span. Nevertheless stuttering may be characterized as mild, moderate or severe not only on the basis of the amount of dysfluency but also depending on the type and nature of the dysfluencies, and the presence or absence of secondaries. In a child with mild stuttering, speech is characterized by simple repetitions with some possibility of tension in the facial muscles particularly around the mouth. Occasionally there may be stoppage of sound production or a rising pitch during a speech block. These disfluencies come and go and are seldom present all the time.

In a child with more severe stuttering there is considerable effort and tension present during speech production. Unlike the repetitions and prolongations that are characteristic of the younger, milder stutterer, the speech blocks are more complete and are present in most speaking situations. The child now begins to change words that he perceives to be difficult and often uses starters (production of extra sounds or movements that the child believes will help in easing speech) and begins to avoid speaking situations. As stuttering persist through childhood and adolescence the stutterer often develops other emotional problems. These emotional maladjustments are often the result of both listener reactions as well as the stutterer’s frustration at his own speech. Embarrassment, guilt and anger often lead to the social isolation of a stutterer affecting

his overall sense of well being, expectations and aspirations.

Stuttering like symptoms may also be seen in other organic disorders such as Tourette's syndrome and spasmodic dysphonia. However these are identifiable as being different from stuttering in terms of the nature of onset as well as other symptoms that are characteristic of them but not of stuttering.

While stuttering is the most commonly recognized fluency disorder there are other lesser known fluency disorders such as cluttering which occur much less frequently than stuttering. A rapid rate of speech that is difficult to understand is the most salient characteristic of cluttering. Excessive speed of speech affects speech intelligibility resulting in a communication breakdown. The rate of speech is so fast that often several speech sounds tend to get dropped making the speech unintelligible. Further, individuals with cluttering have some difficulty in language as well as in organizing their thoughtsIn rare instances ‘adult onset stuttering’ can also be seen. This is acquired in adulthood often as a consequence of an illness or a head injury. It is also referred to as ‘neurogenic stuttering’.

Chapter 6
Language Disorders

6.1 Introduction

Language is a code that we learn in order to express wants and needs and to communicate. All languages have sets of rules that govern them. These are broadly grouped under Phonology, Syntax and Semantics All human languages are characterized by some essential features such as speech sounds, which are combined to form words, which in turn are further combined in to sentences leading to conversations, stories, narrations and so on. . Phonology refers to the study of the sound systems of language. Phonology deals with the description of the systems and patterns of sounds that occur in a language. In order to become proficient users of a language we need to master the phonological rules of the language which enables us to identify the phonemes or speech sounds of that language and sensitizes us to the rules that govern their combinations. Syntax refers to the grammatical rules of language. The syntactic rules of a language determine how words can be arranged in a sentence to indicate the relationships between those words and the meaning of the sentence as a whole. Semantics refers to the study of meaning in language. It encompasses meaning not only at the word level but also at the level of phrases and sentences. It also encompasses our knowledge of the relationship between words, as for instance among opposites.

Language is also described as having content, form and use. The meanings of words can change according to their grammatical context or the manner in which they are said, as for example in puns and sarcasm. There are also rules that govern the use of language across social situations, across listeners, across contexts. The term pragmatics is used to refer to the set of rules that tell us what to say, as also when and how to say it. At the level of pragmatics there is a shift from language as a formal and context independent system as viewed by most linguists until recently, to a broader framework derived from a functional perspective of language, which emphasizes the use of language in social contexts.

It must be remembered that though these distinct aspects of language have been recognized and while it is true that substantial mastery of any one aspect occurs during particular phases of language acquisition by the child, all these aspects act simultaneously in every speech act and there is no clear cut division in their acquisition. The acquisition of one aspect bootstraps another aspect and a delay or disorder in the acquisition of one will affect the others. Language acquisition is also closely linked to social development and socialization.

6.2 Language disorders in children

The study of language disorders is relatively recent in the field of speech –language pathology and has been greatly influenced by the progress made in the new disciplines of psycholinguistics, neurolinguistics and clinical linguistics, in turn contributing to them fairly extensively. As in the case of the speech disorders, language disorders also can be classified as developmental and acquired, depending on the age at which the disorder is seen. Further language acquisition can be delayed or deviant, depending on whether there is an overall delay or whether specific aspects of language are disturbed. Language disorders, like speech disorders, are described most often within the medical model relating them to the cause of the language disorder as in autism or aphasia or dementia. Within the diagnostic label however further description is

carried out with reference to the modality (receptive versus expressive) or particular linguistic level (phonology versus syntax versus semantic) that is affected. Pragmatic and discourse skills are also increasingly being included in the study of the language disorders. It is important to remember that speech and language can and is often affected in the same individual. Similarly the language disorder may encompass any one or more modalities (understanding, speaking, reading and writing) at any one or more linguistic level in the same individual. Language disorders may coexist and be causally linked to other speech disorders such as fluency and articulation disorders. What follows is a brief description of some of the major subtypes of language disorders seen in children and adults, in different diagnostic categories highlighting the linguistic features seen in them.

6.2.1 Delayed Speech Language Acquisition

The most common language disorder is a delay in the development of language characterized by a marked slowness in development. A delay in language acquisition is often caused by organic causes such as a hearing impairment or mental retardation. These delays are comprehensive and will affect all linguistic levels, the extent of the delay depending on the severity of the underlying condition such as the degree of hearing impairment or mental retardation. Children with these disorders are likely to have serious difficulties in language acquisition.

Delayed onset of speech and language is one of the most common consequences of a hearing loss. Children with mild to moderate degrees of hearing loss may exhibit persisting difficulties such as inconsistent responses to sounds and speech, including responses to being called, or to verbal instructions; watching the speakers face closely or asking for repetitions of questions and instructions are often characteristic of children with hearing impairment. They may also speak too softly or too loudly (depending on the type of hearing loss) or appear inattentive, dull and uninterested in group interactions. Their speech may be unclear with parts of words (beginning and endings) dropped.

Children with more severe hearing loss are more easily identified since they do not respond to sound and often use compensatory gestures to communicate. These children require early assessment of the cause of their hearing loss, a suitable line of intervention such as fitting of a hearing aid or a cochlear implant, followed by speech and language training, to acquire language.

In children with mental retardation there is a generalized impairment in intellectual development and adaptive functioning. Consequently there is also a delay in their acquisition of speech and language skills. However children with mental retardation may have communication and learning delays and disorders over and above those warranted by the mental retardation. That is, some children with mental retardation may not communicate even at the level expected of children of their mental age. They may also have other speech disorders such as poor articulation co existing with the delay in language acquisition.

Their overall language development is similar to their typically developing peers, but at a slower rate and this applies to both receptive and expressive language skills. Their comprehension and expressive lexical development lags behind their peers. Their speech is often characterized by poor articulation and poor expressive syntax, resulting in poor speech intelligibility. In some specific subtypes such as Down syndrome, voice is distinctively different - often rough, breathy and

low pitched. Syntax or acquisition of grammar appears to be particularly difficult for children with mental retardation. Some children with mental retardation appear relatively proficient in word recognition skills, but by and large they have poor decoding skills that affect their reading and literacy acquisition.

Children with cerebral palsy (CP) may have difficulty with comprehension and expression of verbal and nonverbal communication. The extent of the communication disorder is generally linked to the severity of cerebral palsy as well as the presence and extent of mental retardation. The interplay of these two factors often determines the exact manifestation or the extent of the communication difficulties of a given child with cerebral palsy, in the continuum from a total lack of speech to almost negligible delay and deviations from normal speech. In conditions like cerebral palsy, speech and language deficits may coexist depending on whether there is an overall cognitive deficit consequent to the cerebral palsy or whether the effect of the cerebral palsy is limited to motor movements alone, affecting speech but not language acquisition.

A cerebral palsied child with severe motor impairment but minimal or no cognitive impairment will have receptive language on par with his normal peers but his speech will probably be well below that of his peers. On the other hand another child with cerebral palsy who has minimal motor impairment but is cognitively impaired to a greater extent, will have both his receptive and expressive language skills constrained by his overall cognitive abilities though his expressive speech may be far superior to that of the child without cognitive impairment. As a rule the greater the motor impairment the greater the discrepancy between the receptive and expressive language skills of the child on the contrary, greater the cognitive impairment the greater the discrepancy between the chronological and language age of the child .The extent of the receptive and expressive language skills delay thus, is determined by the additional impact of the motor disorder. The stages of language development, particularly expressive language, are also influenced by the difficulties in speech production and are affected in a similar manner.

Similarly in children with cleft palate, while the primary deficit may be in speech, if the child has a concomitant hearing loss which is often seen in children with cleft palates, language acquisition may also be delayed depending on the extent of the hearing loss.

Developmental Language Disorders

For a small proportion of typically developing children, the process of language acquisition is not a smooth one. Even though their other development is normal and they have no specific abnormalities, such as a hearing impairment or mental retardation, they seem to have a particular difficulty in acquiring language in the same fashion as their peers. These children are considered to have a condition that is now termed as ‘developmental language disorders’. These subtle language disorders are seen in children who are developing normally or typically, but have a particular deficit in acquiring one or more aspects of language. Among these language disorders three sub types have been identified and described with increasing clarity in the recent past – Specific Language Impairment, Semantic – Pragmatic Disorder or Pragmatic Language Impairment as it is also known, and Language Learning Disability. It is also increasingly recognized that though they are treated as three distinct disorders, there is a considerable overlap between the three with the demarcating lines between them blurring and

merging, particularly as children with these language impairments grow and the communicative and academic demands made of them, change. Children with developmental language disorders often have specific difficulties using language forms that are suited to particular social contexts, or understanding and using figurative language and often demonstrate a significant gap between their verbal and nonverbal abilities.

Developmental Language disorders are further classified in terms of their specific characteristics. A major subdivision is between the receptive and expressive language disorders, depending on whether it is the understanding of language that is affected or the expression of language. A child who consistently confuses between similar sounding words like 'bell' and 'ball', or has difficulty in following oral instructions but overcomes them when there are enough contextual cues as to what is required, could have a receptive language disorder. Other children may have difficulty in retrieving appropriate words, rapidly enough, while speaking. Still others may have no difficulty in expressing their needs simply, but have difficulty in organizing words and sentences when expressing more complicated thoughts and ideas, when describing, defining or explaining events or sharing information. These impairments in expressive language may also affect the child's play and social use of language, leading to poor peer interaction. These children with expressive language delays often do not talk much or often. A 4 year old who speaks only in two word phrases, has an expressive deficit. Receptive language disorders invariably have a consequence for expressive language development. The latter on the other hand can be seen in isolation. Often these disorders coexist. These relatively subtle language disorders often co exist with processing disorders such as auditory processing disorders (not hearing impairment) and deficits in memory and capacity loads. The receptive and expressive disorders could also selectively affect any one or more linguistic aspects of language such as semantics, morphosyntax and syntax, discourse, pragmatics and prosody. Here again a deficit in any one level will have its repercussions on the acquisition and use of the other aspects too.

The receptive and expressive language disorders may be further distinguished in terms of the linguistic level at which the disorder is seen. Phonological disorders are seen when a child has not correctly acquired the phonological rules of his language – the sound system and rules for sound combination. Phonological disorders can be restricted to expressive disorders alone as in children with articulation disorders or may also encompass phonemic discrimination wherein the child is unable to distinguish between subsets of the phonemes of his language such as minimal pairs as in 'pet' and 'bet'. With our increasing understanding of the role of speech perception and its acquisition in child's speech-language development, distinctions are now made between speech sound errors that are seen in spoken speech alone as against those which coexist with difficulties in speech perception. For instance a child says 'mat' for 'bat' but knows the difference between what these objects refer to. On the other hand, another child may be unable to do both, distinguish between these words when spoken by a person, as well as produce it appropriately. While the former who has a disorder in speech production alone is described as having an articulatory disorder, the latter whose difficulty encompasses both perception and production is said to have a phonological disorder. The latter is a more complex disorder affecting language

acquisition at a more central level and the child often simplifies the phonological system consequently being unable to produce speech sounds in a manner that is age appropriate. As a result his speech becomes unintelligible, often his parents being the only ones who can understand it. It may also affect the child's reading and spelling skills.

Similarly children may have specific difficulty in acquiring the grammatical aspects of their language resulting in a syntactic disorder. These children may communicate well in day to day situations where the context provides them with adequate clues about the ongoing communication. However, when more precise communication skills are required as in academics and the process of information gathering which require rapid communication exchange without too many contextual clues, as in schooling; their syntactic difficulties become more apparent and result in communication breakdown. Difficulties in morphosyntactic and syntactic processing are often seen in children with SLI and/ or Language learning disabilities.

Children with semantic deficits have a host of difficulties in both the receptive and expressive aspects of language. They show specific comprehension deficits particularly in response to questions, which is not in synchrony with their fluent and well articulated speech. They tend to get carried away by a word or two in a sentence, without waiting to grasp the meaning of the sentence as a whole. They often exhibit poor listening skills resulting in difficulties in tasks that require precision, such as following directions and grasping the essence of a lecture or narrative. They perform better with concrete step by step instructions and are particularly poor in understanding slang or jargon, making them misfits in adolescent social banter, which are particularly rich in these aspects. When speaking, they have difficulties in word retrieval, and lack precision in word use, resulting in broken sentences with false starts, circumlocutory speech or beating around the bush with frequent use of empty phrases. They have inadequate understanding of the relations between words and the multiple meanings of words They are unable to give clear directions or explain specific concepts and confuse their listeners. Their conversations are characterized by abruptness and abrasiveness as they consistently violate conversational rules. These communicative difficulties are also manifested in their reading and writing skills affecting their ability to process information through the written mode and consequently their thinking and reasoning skills too. The broad based nature of the deficit is also evident in their nonverbal communication since they often have difficulty in interpreting facial expressions. They misinterpret body movements of others and themselves have awkward movements. They misjudge and often violate social rules for physical proximity that are culturally determined. As a result children with pragmatic difficulties have great trouble using language socially, in ways that are appropriate for their age. For instance, they may have difficulty in understanding jokes and following conversations, resulting in exclusion from peer groups.

Children with pragmatic deficits are characteristically poor conversationalists. They tend not to bother about social greetings and have difficulty in initiating and carrying out a social conversation. They are seldom interested in, or able to follow conversational topics that do not relate to them directly and often talk non-stop about their own interests. They have difficulty in monitoring their intonations and use either a flat or

exaggerated intonation pattern. As a result, their conversation can sound too grown up or rude. They also have difficulty in choosing the correct register for their conversational partners, that is when and whom to address formally or informally, and are noted for their use of tactless expressions. They fail to judge and take into consideration the prior knowledge of their conversational partner and either talk down to them or else make no sense to them. The have difficulties in introducing, maintaining and ending topics in conversations. They tend to learn language through memorizing and will tend to focus on specifics in conversation while missing out on the general meaning. As a result they will appear immature in their conversations. Pragmatic skills also include being tuned to the body language of the conversational partner, maintaining adequate eye contact and knowing when to take one's turn. As a result of not paying adequate attention to these nonverbal cues, their communicative behavior appears either irrelevant or rude and inconsiderate and they end up losing the interest of the listener. These children with semantic – pragmatic deficits are often described as having Semantic Pragmatic Disorder (SPD) or Pragmatic Language Impairment(PLI) are most likely to be seen as children with borderline Autism Spectrum Disorders within the medical model.

Language disorders may be restricted to reading and writing alone without spoken language being affected. These children may have difficulties with learning new information in school or in spelling, using words correctly, or composing sentences and essays. Children who have subtle language disorders that manifest at high school level often have a cluster of symptoms. They maybe reluctant speakers, but when they do speak they may sound garrulous with empty speech full of clichés and overuse of some words and phrases with lots of fillers such 'umm' and 'uh uh' and empty words such as 'this' and 'that'. They have difficulty in using complex grammar and cannot logically explain issues. They have difficulty with abstract language and ideas and take a long time to process such information. These children are often labeled as having language learning disability or learning disability.

6.2.3 Language disorders in other developmental disorders

Apart from the specific communication disorders described above, disordered language is often seen in other childhood developmental disorders or maybe acquired after a period of normal speech and language development. In the recent past there is an increase in the incidence of a complex group of disorders seen in young children, termed the Autism Spectrum Disorders (ASD) or the Pervasive Developmental Disorders (PDD).

Children with ASD often have delays in language acquisition or develop unusual ways of communication. A common characteristic shared by all these children is that they all have difficulty in acquiring language and in using it for social purposes Many children with ASD are nonverbal and do not compensate for their lack of speech through nonverbal means such as gestures. Others who are verbal may seem like they have good language skills, but on closer examination it will be apparent that their language skills consist mostly of rote skills such as imitation of nursery rhymes or TV jingles and that they are unable to use language effectively for purposes of communication. Their utterances are often related to their own obsessive preoccupations and result in stereotyped, repetitive or idiosyncratic language. Children with ASD often parrot the speech produced by others in their environment, a phenomenon referred to as 'echolalia'. They fail to

respond to the communication of others and seldom initiate or sustain a conversation. In addition they often have abnormalities of speech affecting such aspects as pitch, stress, rate, rhythm and intonation.

From a linguistic point of view the communication deficits of verbal children with ASD are characterized primarily as semantic-pragmatic deficits. The pragmatic deficits are, as described above, those that affect their conversational skills. At the semantic level, apart from showing delayed development and a restricted lexicon, they have a tendency to interpret words literally and as a result have enormous difficulty in interpreting social subtleties of language forms such as jokes, puns and sarcasm. Their syntax is essentially normal but may be limited in variety. Phonology is generally not affected in terms of producing the correct phonemes of language, but intonation is often limited and monotonous.

Asperger's syndrome is a subtype of ASD and is characterized by some of the social deficits seen in autism, such as poor peer relationship, a lack of empathy and an obsessive focus on some topics. However these children are intelligent and do not have delays in language acquisition. Asperger's is therefore considered as representing a high-functioning form of autism. Children with Asperger's are not normally identified as early as the other subtypes. They are generally enrolled in schools and their abnormalities are not identified until school age. They attract attention by their eccentric behavior (such as an obsessive preoccupation with the class attendance role call) and their difficulty in interacting with peers.

Traumatic brain injury (TBI) is a common cause of loss of speech language skills in typically developing children. Speech-language deficits are commonly observed in children who suffer TBI and are both receptive and expressive. They include difficulties in auditory comprehension of verbal and nonverbal stimuli despite normal hearing, including difficulty in pointing to common objects that are named and in following simple verbal instructions. They could also have expressive language difficulties such as difficulties in naming common objects, repeating words and sentences and in describing things and events. Some may retain their earlier expressive language skills but lose the clarity of speech and their verbal fluency, i.e. become dysarthric. In extreme cases the child may become totally mute. Reading and writing skills if acquired prior to the injury may also be affected with decreased reading comprehension and difficulty in writing. In addition children with TBI often suffer from attention and memory deficits.

Apart from the above, it has also been documented that there is high incidence of communication or language disorders in children diagnosed with mental or psychiatric disorders in childhood such as ADHD, oppositional and or conduct disorders, disruptive behavior disorders and emotional disorders. The communication disorders seen in these children range from isolated speech disorders including the dysarthrias and apraxias to delayed language acquisition, difficulty in abstract language, semantic-pragmatic deficits and poor social communication. Language disorders are often seen to co occur with psychiatric disorders and other childhood syndromes such as Landau Kleffner Syndrome and Fragile X. Linguistic descriptions are likely to provide a wealth of information on these disorders

leading to a better understanding and management of the same.

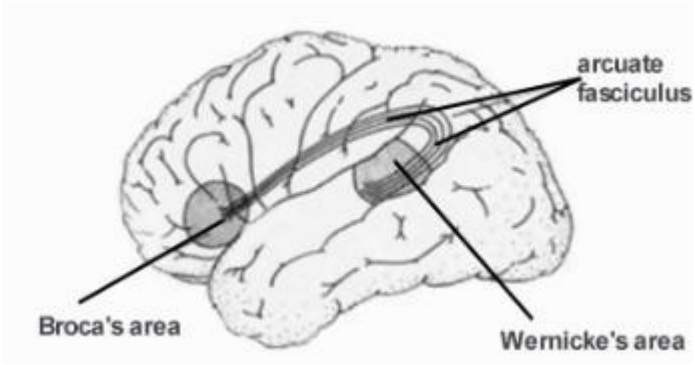
6.3 Acquired Language Disorders

Language skills in adults may deteriorate due to old age and senility. Language disorders in adults are also often a consequence of neurological disorders such as strokes, head injuries, tumors and other degenerative disorders such as the dementias. The latter are termed acquired neurogenic communication disorders. The human brain, in particular the left hemisphere of the brain controls/ serves most of the neural underpinnings of language acquisition and processing and any damage to the brain is likely to disturb the communication skills of the individual.

6.3.1 The Aphasias

Up until a couple of decades ago, any language disorder that was a result of acquired brain damage was termed as 'aphasia'. Currently, the term is used in a more restricted sense to denote language loss subsequent to a cerebrovascular accident (CVA) such as a stroke. Aphasia or loss of language due to brain damage has been studied over a hundred and fifty years. During the first100 years it was established that in the majority of human beings, and in all those who are right handed, the left hemisphere of the brain is involved in language processing. This is also true of some lefthanders, while in other lefthanders the right hemisphere plays the major role in language processing. Research from the 1860s to the 1960s primarily correlated lesions in different parts of the left hemisphere of the brain with different patterns of language loss, implying that these regions controlled or served these language functions in the normal human brain during language processing.

The major subtypes of aphasia that have been identified so far are represented in Figure I which also indicates the location of the lesion that is generally seen in these subtypes of aphasia.



Source:
http://www.google.co.in/imgres?imgurl=http://img33.imageshack.us/img33/4985/92054633.jpg&imgrefurl=http://www.futurehealth.org/articles/The-Disconnection-Syndrome-by-Gary-Schummer-090910-239

Broca's area: Expressive aphasia

Wernicke;s area: Receptive aphasia

Arcuate fasiculus: Conduction aphasia

Fig 2 - The left hemisphere of the brain depicting areas, damage to which results in different subtypes of aphasia

These are:

i. Global Aphasia in which there are large lesions resulting in severe receptive and expressive language disturbances, along with reading and writing disorders.

ii) Expressive or Broca's aphasia in which the lesion is in the anterior part of the brain resulting in severe expressive deficits with comprehension relatively preserved.

iii) Receptive or Wernicke's aphasia in which the lesion in the temporal lobe results in severe comprehension deficits, while expressive language is relatively preserved.

iv) Conduction Aphasia with a lesion in the arcuate fasciculus disconnecting the Wernicke's or receptive language area from the Broca's or expressive language area. As a result while both comprehension and expression are relatively well preserved, the patient has difficulty in repeating what is said to him.

v) Anomic Aphasia is the mildest form of aphasia and can result from small lesions anywhere in the language areas of the brain. The most significant characteristic of this type of aphasia is a word finding difficulty. While all aphasics suffer from word finding difficulties, it is the only symptom in anomic aphasia.

The subtypes are broadly divided as the nonfluent and fluent aphasias depending on the relative degree of fluency that is retained by the patient. The Global and Broca's aphasias are characterized by slow and sparse speech output while in the remaining subtypes of aphasia, the patient is relatively fluent though his speech output is often meaningless and unintelligible. These two major subgroups are also referred to as the anterior versus the posterior aphasias as the lesion in the nonfluent group is located in the anterior portion of the left hemisphere, whereas those in the fluent group are located more posteriorly.

Linguistically, phonetic errors are associated with Broca's aphasia who may have co morbid verbal apraxia and/or dysarthria, phonemic paraphasias are seen in both Broca's and Wernicke's aphasia. Syntactic errors that are agrammatic in nature are also associated with Broca's aphasia while syntactic errors of the paragrammatic type are seen in Wernicke's aphasia. Semantic deficits are more common in the posterior aphasia and may involve semantic discrimination as well as semantic paraphasias. Deficits in word retrieval while present in all types of aphasia are as a rule the only deficit in anomic aphasia.

6.3.2 The Alexias and Agraphias

The acquired reading and writing disorders referred to as the alexias and agraphias occur due to the same causative factors as the aphasias. While alexias and agraphias are often present along with the aphasias, in rare instances a patient may have a relatively isolated disorder of reading and writing or either of them. These patients have been studied extensively in the latter half of the 20th century by neuropsychologists and other neuroscientists in order to arrive at a neural model of reading. In the process several distinct subtypes of acquired dyslexia, such as deep dyslexia, surface dyslexia, phonological dyslexia, and pure alexia, have been identified among others. The distinct preservation of the ability to access meaning directly from the printed word while reading it out incorrectly as in deep dyslexia and the ability to read only by converting the letters to their sounds and subsequently deriving their meaning, even when it differs from the standard meaning as in surface dyslexia have been seen as evidence that the human brain is capable of using ' two routes' in reading and one or the other may be selectively disrupted in the dyslexias.

6.3.3 Traumatic Brain Injury (TBI)

The loss of language subsequent to head injuries was in the last century considered to be aphasia. However, with an increasing appreciation of the differences in the underlying pathology, the recovery process and the subtle differences between the two, it is now referred to as TBI. Few patients with TBI may exhibit aphasic disturbances. In a majority there are difficulties in communication efficiency and coherence, particularly in the comprehension of conversational inference and inadequate expressive conversational skills. Cognitive deficits such as loss of attention, slowed information processing and loss of executive control lead to the communication difficulties of the patient with a TBI. The ability to engage in socially effective verbal interaction is often a consequence of

problems in planning, problem solving and poor abstract thinking.

6.4.4 Right Hemisphere Syndrome

In the majority of the human population, including all right handed individuals and a substantial proportion of left handed individuals, the left hemisphere of the brain serves language functions. Consequently aphasia or severe language disturbances are seen only after damage to the left hemisphere of the brain. In a very small proportion of people aphasia can result from lesions in the right hemisphere. The left hemisphere is therefore considered the language hemisphere and the right hemisphere was seen as the silent hemisphere which is not involved in language functions.

However, during the latter half of the twentieth century, there has been increasing experimental evidence to indicate that the right hemisphere of the brain is also important in communication It is now recognized that RHD patients also show several cognitive and communicative deficits. These include reduced discourse comprehension and production and lack of specificity in communication. They also show a reduced sensitivity to contextual information, prosody and emotional tone. Their appreciation of word play as in humor and sarcasm are also affected. As a result their communication appears shallow and superficial.

6.4.5 Dementias

Dementia is the term applied to a diffuse deterioration in the mental functions, resulting from a range of organic diseases of the brain. Patients with dementia show multiple deficits including memory impairments, disturbance in executive functioning such as planning, organizing, sequencing, or abstracting and speech-language. These impairments are progressive in nature and interfere with social and occupational functioning. Some of the speech-language characteristics of patients with dementia may initially seem similar to the aphasias, agnosias and apraxias. Although individuals in early stage AD generally comprehend what they hear and read, they quickly forget it. Mild AD patients often miss the point of a joke or are confused by sarcasm. Some individuals exhibit logorrhea or uncontrollable and excessive verbal output. In the initial stages writing may be more affected than oral language and written discourse may contain intrusions, perseverations, and spatial mechanical disturbances. As the disease progresses there is general deterioration in communication skills, so much so that it becomes increasingly meaningless and ends in jargon or isolated words or phrases.

Again it is important to remember that in multilingual/ multidialectal countries like India ours attention has to be paid to the socio – linguistic and cultural background of the individual whose sample is being analyzed in order to arrive at a careful description of the erroneous or deviant language sample.

Language samples

obtained in response to the picture of a ‘mobile health team’. The picture showed the members of a mobile health team examining children carried by their mothers in a rural area. The setting was that of an open area in the country side. A doctor and two nurses are shown examining two infants while another member of the team, possibly the driver of the van, is standing nearby (from Karanth, 1980).

Sample I of Patient HD, diagnosed with Broca’s or expressive aphasia.

/Daaktar bandu noodtaare….. nars iddaare….innobbaru iddaare…aameele tu vimen iddaare….aameele i….kaant mek aut vhat it iz….halliyavaru…...nardanarz…….avarige…van maen iz hiyar ….egzaminashun ..maaduttaare/

Doctor has come and is seeing (examining) …nurse is here…..another person is there…after that two women are there…….after that I can't make out what it is…..villagers……northerners….for them…one man is here…..examination is being done.

Sample II of an aphasic patient diagnosed with global aphasia

/ gottu.. idu ondu ….ella aite.
Adeenee ….baruttaane.
Idellaa summane ---
Idellaa…. idu gottu adu idu, avanu ivanu, svalpa/

I know!..... this one…… everything is there. That is …(he) is coming…… All this…. is simply (needless) ……. all this……this (I) know…..that, this, that one, this one …a little bit.

Self test

Chapter I

I. Choose the correct answer

1. Non-verbal communication can happen in following modes?

A. Writing
B. Gestures
C. Sign language
D. All of the above

1. Which of the following statement is incorrect

A. Human beings are born with predisposition to learn language
B. Environmental factors influence language development
C. Child learns language faster when it is young
D. Infants of different culture learn language at different phase.

2. Communication disorders can have dysfunction in following entity

A. Speech
B. Cognition
C. Language
D. All of the above

3. How would you note a child whose both comprehension and expression are equally delayed

A. Developmental delay
B. Delayed speech and language
C. Inadequate speech and language
D. Specific language impairment

4. Which is the cause of acquired communication disorder

A. Birth injuries
B. Mental retardation
C. Infantile epilepsy
D. Stroke

II. True or False

1. All the modes of communication are mutually exclusive.

2. Most of the communication skills are acquired at the younger age.

3. Biological and environmental interferences are not going to influence communication development of a child.

4. Once completely acquired the skills of communication would never be lost.

5. The impact of hearing loss on language acquisition depends on age of morbidity (incidence).

6. The speech language problems in children are characterized as delay and disorder.

7. Communication disorders occur due to causes of pre, peri, and post natal nature.

8. Abusive behaviors like excessive screaming and yelling leads to voice disorder.

9. Developmental language disorders are generally easy to be identified by the parents.

10. Speech language pathologists are specialists in identifying hearing difficulties.

Chapter II

I. Choose the correct answer.

1. The system that enables us to convey meaning using speech or writing is called

A. suprasegmantals
B. Language
C. Communication
D. Information integration

2. The frequency range of human voice is
A. 20 Hz to 20.000 Hz
B. 300 Hz to 3500 Hz
C. 30Hz to 350 Hz
D. 3 Hz to 35 Hz

3. What decides the quality of voice

A. Frequency
B. Loudness
C. Resonance
D. All of the above

4. This of the following is not an articulator

A. Lung
B. Velum
C. Lips
D. Tongue

5. The location of constriction in oral tract is called as

A. Manner of articulation
B. Pharyngeal constriction
C. Place of articulation
D. Compensatory articulation

6. The rules of language that deals with sentence formation and structure is known as
A. Phonology
B. Semantics
C. Syntax
D. Pragmatics

7. The division of pragmatics that deals with conscious knowledge about use of once own language is referred to as
A. paralinguistics
B. Pragmatic linguistics
C. Interlinguistics
D. Meta linguistics.

8. Which of the following is not a language family of India
A. Indo-European,
B. Dravidian
C. Basque language
D. Mon-Khmer

9. Semantics in its colloquial aspect called as
A. Meaning
B. Grammar
C. Structure
D. Usage

II. True or false

1. The child is considered having developmental disorder if his language skills are not in tally with his peers

2. Dysphonia(a voice disorder) is a language disorder

3. The expressive language disorder population is defined as having difficulty in comprehending speech utterances.

4. Adding "a" as a prefix of a disorder term (e.g. "A"+phasia- Aphasia) demotes complete loss of the skill.

5. Sounds of speech have its frequency ranges from 20-20000 Hz.

Chapter III

I.Choose the correct answer

1. A delay in birth cry may end in
A. Deprivation of brain oxygen
B. In Flow Amniotic fluid in to vocal tract
C. Low activation level of the newborn
D. Fits

2. Most common infant cry is suggestive of
A. Hunger
B. Discomfort
C. Sleep disturbances
D. Restlessness

3. Which of the following two are exclusive for an individual
A. Fingerprint and Handwriting
B. Handwriting and voice
C. Voice and skin color
D. Fingerprint and voice

4. The signs of pubertal changes in voice are
A. Thickening of vocal folds
B. Lengthening of vocal folds
C. Lowering of larynx
D. All of the above

5. Which of the following is in correct series when the development of sounds are considered
A. Clusters – vowels- fricatives
B. Vowels – laterals- clusters
C. Vowels- fricatives- laterals
D. None of the above

6. The umbrella term under which disorder of motor weakness and developmental disabilities fall is
A. Cerebral palsy
B. Mental retardation
C. Autism
D. Misarticulation

7. Disorder in which cognitive function of memory deterioration is the classical feature is
A. Aphasia
B. Schizophrenia
C. Dementia
D. Developmental delay
8. The aphasic symptom where in the patient finds difficulty in naming objects is called as
A. Aphemia
B. Anomia
C. Agraphia
D. Alexia

9. The high functioning pervasive developmental disorder syndrome
A. Autism
B. Childhood disintegrative disorder
C. Asperger's
D. Herler's

10. This among the following is not the feature of specific language impairment

A. No frank neurological sign
B. Problems with verbal language acquisition
C. Paralysis of limbs
D. Normal nonverbal ability

II.True or False

1. The intellectual level of the child is least important for learning language

2. For the assessment process the speech sample has to be taken from the client's least proficient language

3. Assuming that the child acquires his first word by age of one year, he would learn another 5000 words by the end of his second year.

4. Human brain is specially tuned to learn language.

5. The more complex a sentence is more fluent is the speech of a stutterer

Chapter IV

I.Choose the correct answer

1. This of the following is not a measure of fluent speech
A. Accent
B. Rate
C. Effort
D. Continuity

2. Which of the following professionals are involved in rehabilitation of a multiplely disabled child

A. Pediatrician
B. Physiotherapist
C. Neurologist
D. All of the above

3. The following classification happens to classify the disorder based on time of acquisition
A. Congenital Vs acquired
B. Speech Vs language
C. Early Vs later
D. Syndromic Vs Non syndromic

4. The following is considered as an aspect of speech
A. Voice
B. Fluency
C. Articulation
D. Semantics

5. The condition called cleft is seen often on

A. Lower lip
B. Upper lip
C. Upper palate(hard palate)
D. Both b and c

II.True or False.

1. The voice stays constant through out the life of an individual.

2. During puberty voice pitch increases in males.

3. By 4 years a normal child can produce all speech sounds of his language.

4. In the developmental process consonants are acquired prior to vowels.

5. A normal child acquires his/her first word at the age of one year.

6. A normal child acquires his/her rudimentary sentence production at the age of 18-24 months.

7. Turn taking (waiting for the speaker to finish his turn) is a semantic skill.

8. Language continues to develop even during geriatric stages and never deteriorates.

9. The social rule of language is called pragmatics.

10. Stuttering seen in young children are called Neurogenic stuttering.

Chapter V

I. Choose the correct answer.

1. The following is characterization of a disordered voice
A. High pitch
B. Bad quality
C. Hyper nasality
D. All of the above

2. Hoarseness , Raspy , breathy are terms used with which of the following disorder
A. Dysphasia
B. Dysphonia
C. Dysarthria
D. Dysgraphia

3. Vocal hygienic behavior is
A. Excessive screaming
B. Mimicking
C. Throat clearing
D. None of the above

4. Vocal abuse /misuse result in
A. Lengthening of vocal folds
B. Decreased growth of larynx
C. Vocal nodules
D. Difficulty in swallowing

5. The major cause of dysphonia(hoarseness) in children is
A. Laryngitis
B. Pharyngitis
C. Vocal cord paralysis
D. Vocal nodules

6. The surgery by which the cancerous vocal folds are exercised is called as
A. Mandibulectomy
B. Thalamectomy
C. Laryngectomy
D. Pharyngectomy

7. /bananana/ for /banana/ is an example of ---------- error type in misarticultion .
A. Omission
B. Distortion
C. Addition
D. Substitution

8. Which of the following is not the feature of stammering speech
A. Blocks
B. Lisping
C. Hesitation
D. Prolongations

9. The following is the organic cause of misarticulation

A. Faulty learning
B. Cleft of palate
C. Apraxia
D. Both B and c

10. Ta ta ta table is typical example of ---------- in dysfluent speech
A. Prolongation
B. Hesitation
C. Audible pause
D. Repetition

II. True or False

1. The condition where in the normal pubertal pitch drop in high pitch juvenile voice is called androphonia.

2. Tongue tie is one of the causes of voice problems

3. Apraxics can perform voluntary speech movements easily
4. Cluster (two consonant blends) are easiest to produce by a misarticulation sound

5. The speech disturbances (at phonemic level) seen in cases with language disturbances of central nature is called paraphasia

6. The features like facial grimaces , hand clenching seen along with stuttering speech are called as primary features of stuttering.

7. The dysfluency condition of cluttering(fast rate of speech) is purely a speech disorder.

8. The symptoms of neurogenic stuttering tends to vary according to the situation

9. The stuttering like symptoms seen in children who are in learning process is called normal non fluency

10. The vibrating chambers present throughout the vocal tract is called as articulators.

Chapter VI

I. Choose the correct answer.

1. Which of the following is not a cause of delayed speech and language acquisition
   A. Mental retardation
   B. Autism
   C. Hearing loss
   D. Dementia

2. The major associated problems reported in client with cleft palate is
   A. Mental retardation
   B. Tongue tie
   C. Hearing loss
   D. Asperger's syndrome

3. The client is unable to initiate and maintain a two way interaction; he is having disorder of following nature
   A. Semantic
   B. Phonologic
   C. Syntactic
   D. Pragmatic

4. The communication deficits seen in ASD (Autism Spectrum Disorder) is called as
   A. Semantic pragmatic disorder
   B. Semantic phonologic disorder
   C. Semantic morphologic disorder
   D. Semantic syntactic disorder

5. Which of the following is not a cause of adult aphasia
   A. CVA
   B. TBI
   C. Degenerative condition
   D. Spasmodic dysphonia

6. Verbal language in right handed individuals is located in
   A. Left hemisphere
   B. Right hemisphere
   C. Corpus collosum
   D. Cerebellum

7. ---------- is the aphasic condition that is resulting as a product of disconnection between receptive and expressive region of brain
   A. Remote aphasia
   B. Subcorical aphasia
   C. Isolation aphasia
   D. Conduction aphasia

8. Which of the following is not a feature of Broca's aphasia
   A. Phonemic paraphasia
   B. Dysarthria
   C. Agrammatism
   D. Confabulation

9. Which of the following can co-occur with aphasics
   A. Dysarthria
   B. Apraxia
   C. Alexia
   D. All of the above

10. Which of the following is feature of RHD
   A. Complete loss of verbal language
   B. Deficits in perceiving prosody
   C. Phonemic paraphasia
   D. All of the above

II. True or False

1. The comprehension and expression of lexical items lags behind in the child with delayed speech and language acquisition.

2. There is possibility that cerebral palsy might only affect speech and not language acquisition.

3. It is not possible to have language deficits that purely affects reading and writing levels of communication only (without affecting oral spoken communication)

4. Anterior aphasics are fluent

5. Language skills of PDD (Pervasive Developmental Disorder) consist primarily of rote skills.

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Foreword

All India Institute of Speech and Hearing (AIISH) is a leading institute serving individuals with communication disorders in south Asia, established on 1965.The institute appreciates research in the field of Speech language sciences, speech language pathology and Audiology using the fund called AIISH Research Fund(ARF), raised from the beneficiary population of the institution.

Several research projects is being proposed in order to avail the fund for research purpose, one of them has resulted in development of this practical work book. Lack of manpower to transcribe existing speech language samples created a need to develop a kit to train eligible transcribers. Transcription of spoken language samples would serve as a huge data base of many speech language disorders that helps in clinical as well as research activity. Dr.K.S.Prema, Prof. of Language Pathology, Dept. of Speech-Language Sciences, AIISH, Mysore, initiated the idea to increase manpower generation in speech language transcription, by proposing a project through which curriculum was developed to train volunteers to transcribe speech language transcription. The name of the project is ñDevelopment and Evaluation of Curriculum for Speech Language Transcriptionò, numbered 3.46. The principal investigator has taken all possible inputs from an expertise phonetician, Prof.Peri Baskara Rao, Tokyo University of Foreign studies, where ever necessary.

The book contains two sections, the first section is written by Prof. Vaithyanatyhan, Professor of Linguistics Department of SLHS Sri Ramachandra University. The author is one of the leading linguists and a well known tutor in field of linguistics. This section highlights the influence of transcriberôs native language on transcription and also agreement types of transcripts

The second section speaks exclusively of application of transcription, not restricting it to speech language field alone. This section of the book is authored by Dr. K. J. Ramadevi Sreenivas Clinical Assistant Dept. of Audiology AIISH, Mysore. The author of this section has a doctorate in the fields of linguistics.

Prof.K.S.Prema

Dept of Speech Language pathology
Principal Investigator of the project

Contents

Accuracy of transcription

Purpose of clinical transcription

Types of speech sample

Methods o f transcription

Speech language transcrip**tion**

Chapter I

Influence of Native Language on Phonetic Transcription

I.1. Introduction

Analysis of Speech and Language has been the common area of interest to Linguists and speech-language pathologists. However, the main difference has been that while linguist is interested in the normal language, speech language pathologist is concerned with deviant/disordered speech and language. In recent times, clinical linguists have become an extended member in analyzing the deviant language and speech. The former focuses on establishing normative information, the latter two have evaluation and or diagnosis as their primary goal. The linguistic investigations that have been driven by three fundamental factors such as *observation, description* and *explanation* in analyzing normal language has been sincerely taken as the thumb rule by the later two groups in analyzing deviant language. Observation refers to the systematic collection of data, which can be analyzed using language analyzing principles. The Linguists have the preferred way of data collection employed phonetic transcription and there has been no exemption to Speech Language Pathologists and Clinical Linguists from this known means.

One of the primary goals of a Speech-language pathologist is to diagnose clients with speech-language problems and initiate appropriate intervention. The first step in that direction is to carry out a detailed evaluation of the speech language performance of the clients. Of the various speech problems encountered in the clinic, children and adults with phonological problem is not that uncommon. The understanding of the phonological problem begins with accurate description of the speech (phonetic events) of the client and not the nearest phonetic equivalent. Transcription of the speech, therefore, occupies the central stage of phonological disorders in relation to assessment, therapy and identifying the sound system that operates in the disordered speech. Transcribing the verbal output of a client/subject is equally important when one attempts to either trace the language development in children or when one attempts to determine the language status of a client.

I.2. what is Phonetic Transcription?

Transcription generally means writing down what one hears using alphabets, icons or any special symbols/codes. It would not be out of place to record that the 1st verbatim transcription was believed to have been done by Lord Ganesha who wrote down Mahabharatha as dictated by Saint Vedavyasa.

Phonetic transcription implies recording the phonetic features of the sound signals that one auditorily perceives using specially designed phonetic symbols. In phonetic transcription one makes an attempt to capture the phonetic features such as place, manner and voice features of a sound not only in isolation but also in varying phonetic contexts. The presence of different speech sounds in natural languages implies the normal alphabets are not sufficient for transcription task. However, a phonetic transcription can provide a function that orthography cannot. Unlike the traditional Roman alphabet, phonetic transcription displays a one-to-one relationship between symbols and sounds. Phonetic transcription allows us to step outside of orthography and examine differences in pronunciation within a given language (dialectal variations), as well as to identify changes in pronunciation that may take place over time.

Realizing this practical difficulty The International Phonetic Association has proposed a set of specialized symbols popularly known as "International Phonetic Alphabet". IPA is a system of phonetic notation based on the Latin alphabet, devised by the International Phonetic Association as a standardized representation of the sounds of spoken language. Primarily British language teachers, with later efforts from European phoneticians and linguists, originally created it. It has changed from its earlier intention as a tool of foreign language pedagogy to a practical alphabet of linguists. The IPA is designed to represent only those qualities of speech that are distinctive in spoken language. Occasionally symbols are added, removed, or modified by the International Phonetic Association. As of 2008, there are 107 distinct letters, 52 diacritics, and 4 new marks in prosody in the IPA chart. Foreign language students, teachers, linguists, speech language pathologists and therapists use IPA. IPA is designed to represent only those qualities of speech that are distinctive in spoken language and to represent additional qualities of speech such as lisping, and sounds made with a cleft palate, an extended set of symbols called the Extensions to the IPA is used. Refer to Appendix I for revised (2005) IPA symbols and the extended symbols (2002). Beyond the letters themselves, there are varieties of secondary symbols, which aid in transcription. Diacritic marks can be combined with IPA letters to transcribe modified phonetic values or secondary articulations. There are also special symbols for suprasegmantals features such as stress and tone that are often employed. In addition to marks for stress, pauses, syllable divisions, the IPA also provides diacritical marks to show how the same sounds are modified.

Extension of the IPA has been developed with a specific purpose/different goal. Transcription of disordered speech has been a challenging task to Linguists and Speech Language Pathologists. Ball (1994 & 1999) has been the primary source for introducing appropriate modifications to suit the disordered speech. Such a proposal has been accepted and adopted by clinical Linguistics and Phonetics the official Journal of ICPLA.

Phonetic transcription is a sound-by-sound interpretation of speech, employing an alphabet system to represent all the sounds of a language without any overlap (Sing et al. 2006). In a phonetic transcription, every symbol stands for one sound and one sound only. A phonetic transcription can be used prescriptively, to show the learners how a given word or phrase should be pronounced. The transcription can represent a precise, standard pronunciation, independent of the individual or regional accent of any person. A phonetic transcription can be used diagnostically, to record and analyze the speech of Clients having some speech problem.

Another commonly encountered alphabetic tradition, other than the IPA, is the Americanist phonetic alphabet, originally created for the transcription of Native American and European languages. But one can observe the American phoneticians and speech pathologists often use slightly modified symbols of Black and Trager or Pike for transcription. Transcription is needed in the field of linguistics, Speech language pathology and Speech sciences.

I.3. Types of transcription

In a transcription task, listeners produce written protocols of a speaker's utterances. This task can be used in two different ways: a patient's transcription of normal speech can be used to examine his or her perceptual, comprehension, or writing proficiency

and a normal listener's transcription of a sample of disordered speech can be used to characterize the nature and degree of the speaker's output disorder (Ball et al.1997). The transcription procedure in speech pathology is an extension of the procedure that has been employed by linguists in the phonological analysis of the language. One can observe the mention of two types of transcriptions in the phonological literature, viz, narrow (phonetic) and broad (phonemic) transcriptions. Phonetic transcription gives importance to every possible phonetic feature, observed and heard, by the transcriber. For instance one can observe the lisping in an individual's pronunciation of the sound [s] in the word 'sin' and transcribe it as [s̲In]. Such a transcription is regarded as phonetic transcription. In contrast phonemic transcription overlooks the perceived phonetic features and transcribes only the phonemes of the language. Phonologists have, hence, recognized two types of transcription errors, namely, under and over differentiation. These transcription errors in essence either under estimate or over estimate the phonemic system of the language. So if the transcription is to be adequate these errors need to be eliminated. Whether to follow phonetic or phonemic transcription – is the dilemma of the clinical phonologists that will be addressed when we discuss the relevance of phonetic transcription in disordered speech.

I.4. Narrow versus broad transcription

Phonetic transcription may aim to transcribe the phonology of a language, or it may wish to go further and specify the precise phonetic realisation. In all systems of transcription one may therefore distinguish between broad transcription and narrow transcription. Broad transcription indicates only the more noticeable phonetic features of an utterance, whereas narrow transcription encodes more information about the phonetic variations of the specific allophones in the utterance. The difference between broad and narrow is a continuum. One particular form of a broad transcription is a phonemic transcription, which disregards all allophonic difference.

The advantage of the narrow transcription is that it can help learners to get exactly the right sound, and allows linguists to make detailed analyses of language variation. The disadvantage is that a narrow transcription is rarely representative of all speakers of a language. A further disadvantage in less technical contexts is that narrow transcription involves a larger number of symbols, which may be unfamiliar to non-specialists.

The advantage of the broad transcription is that it allows statements to be made which apply right across a relatively diverse language community. It is thus more appropriate for the pronunciation data in foreign language dictionaries, which may discuss allophones in the preface but rarely give them for each entry. To understand and able to make a good narrow phonetic transcription it is the necessary that the transcriber should have a sound knowledge of the pronunciation of the various symbols of the IPA.

I.5. Transcription Errors

In phonemic analysis it is recognized that an analyzer often makes two types of transcription errors. They are *over differentiation* and *under differentiation.* The process of under estimating the phonemic distinctions that exists in the language being analysed and treating them as not existing is referred to an under differentiation. On the other hand over estimating certain phonemic distinctions that do not exist in the language being analysed and considering them as distinct is termed as over differentiation. A Tamilian

considering the aspirated and unaspirated /kh/ and /k/ as one single unit /k/ is an illustration for under differentiation. Similarly a Hindi native language user considering /k/ as differentiated varieties such as /k/ and /kh/ would be an apt illustration for over differentiation. Phonologists, hence, would always recommend the elimination of over and under differentiation if the transcriptions have to be error free and the phonemic system of a language is not compromised. This process of misperception is generally attributed to the influence of ones own native language.

Phonetic transcription is a straight forward case. One need to simply write the phonetic symbols that corresponds to the sounds one hears. One needn't understand what one hears but one need to recognize the sounds to transcribe them.

I.6. What influences Transcription?

Correctly perceiving and producing the sounds of a Second language (SL) or for that matter even the first language is a very difficult task. Problem of misperception are observed even in those who have been exposed to SL for a considerable period of time (Pallier et al 2001). Undoubtedly accurate perception is a necessary condition and primary requirement of a good transcriber. Dialectal variations, length of time the non-natives exposed to the target language have been offered as possible explanations for the difference in the perception of sounds and hence the transcriptions.

Languages differ in their phonetic/phonemic inventories. Naturally, this would create difficulties when a non-native language (foreign) is encountered. For instance, if two foreign sounds are assimilated to a single mother-tongue category the difference between them will be pretty difficult to discern (Wang et al 2009). Typical example of this case is the observation that Japanese learners of English will have problems in identifying English liquid consonants /l/ and /r/.

The effects of listener's native language on the transcription of words have been extensively investigated in recent times (Burda et al 2009). Cross-language research has indicated that speech contrasts present greater perceptual difficulty for adult non-native listeners. In their research Burda et al (2009) have found that native English speaking listeners has statistically significant higher transcription scores compared to non-native listeners when native speakers and non-native speakers listened to English words produced by native speakers and non-native speakers. Similarly words articulated by native speakers indicated higher transcription scores compared to item produced by non-native English, in this case Spanish speakers. Also experimental studies by Polka (1991, 1992) have shown that substantive phonetic experience influences the perception of non-native contrasts. Two common sources of variability have been said to influence the perception of non-native sound, particularly consonants, viz, vowel context and speaking rate.

To make error free transcription it is important that the transcribers divorce themselves from their linguistic backgrounds. That is, one should make conscious attempt to limit the effect of ones knowledge of the language on the speech of the subject/patient. Transcribing taped samples from an unknown language would be an ideal way to accomplish this.

I.7. Requirements of a good transcriber

The transcriber is expected to have sufficient ear training and sound knowledge of phonetic symbols

and their values before commencing on transcription as this would facilitate correct transcription.

Accuracy of transcription and validating the accuracy of transcription are two fundamental goals of a transcriber. Without an accurate description one can't provide a meaningful diagnosis, or prepare a helpful remediation plan (Ball, 1995). The validity of transcription should be established by a trained phonetician who could check the transcriptions if not completely, at least a representative portion of the material.

It should be remembered that the pronunciation of the symbols can't be learned from the text. Besides it is not just sufficient to learn the symbols that correspond to a particular language alone as the speech pathologists are likely to engage in remedial program with patients of different linguistic background. Besides, in the field of speech pathology, the clinician is likely to encounter clients who can produce a range of non-native sounds.

Phonetic transcription is a skill that needs to be learnt and practiced. So too, it is obvious that in order to perform good transcription the clinician should have a sound knowledge of the phonetic symbols and how they are pronounced. This is possible only under the guidance of a competent phonetic teacher who could pronounce the IPA symbols and train the clinician how to produce the IPA symbols and to transcribe too. Auditory perceptual judgment by the examiner forms the basis for intervention decisions for most aspects of clinical phonology. For the transcription to be accurate the examiner should have a good ear to perceive the subtle variations in the phonetic quality of, say, the disordered speech. Simultaneously he/she should be a keen observer to see and record the compensatory articulatory postures of the client. And last, but not the least, the transcriber should not come under the influence of his/her native tongue while transcribing as that is likely to affect the analysis to some extent. It is, hence, advised that a transcriber should avail taped material to practice and improve their skills.

To undertake good phonetic transcription it is necessary that a transcriber should have a competent phonetic teacher who can pronounce not only the standard phonetic symbols of the IPA but also the symbols in the extended version.

I.8. On-line/off-line transcription

An interesting issue concerning transcription is whether to do on-line (live) or off-line (recorded) transcription of the samples. Both have its advantages and disadvantages. The advantages of on-line transcriptions are: 1) the transcriber hears the original sample rather than the electronically processed signal; 2) the transcriber can take note of certain articulatory gestures that may aid the transcription. The disadvantages of on-line transcriptions are: 1) as the clinician has to complete the transcriptions within a given time frame, the transcription becomes difficult bearing in mind the subtle, coordinated and intricate movement involved in speech production. 2) the clinician has only one chance to transcribe an utterance, 3) the reliability check may not be feasible unless two clinicians are available to simultaneously transcribe the speech of the client. Nevertheless the on-line method data analysis may be choice of the clinician as in the case of difficult to test children and in those case of clients whose out put is very limited. Clinicians may be encouraged to do on-line transcription whenever possible and particularly in the initial phases of training and once they have acquired confidence in transcription they might employ off-line method. They should have the option

to follow any one of the procedure depending upon the merit of the case.

I.9. Reliability of the transcription

One of the major concerns regarding transcription relates to the accuracy of transcription. Clinicians are concerned whether or not the transcriptions are valid representation of a client's productions. While making transcriptions, clinicians primarily rely upon auditory perceptual judgments. Because of this it is important and obligatory for clinicians to establish the reliability of their perceptual judgment. Clinicians usually use agreement between two independent transcribers as a means of establishing reliability. Inter judge agreement or reliability is determined by comparing one examiner's transcriptions with that of another. Particularly in the case of clinicians beginning to make judgments about accuracy of phonological productions, comparing their transcriptions with that of an experienced phoneticians or another clinician establishes the accuracy of judgment and hence the transcription too. A commonly used method of determining inter judge reliability is item-by-item agreement. This method compares the clinician's judgment on each test item, in this case, the target sound with another person and the percentage of agreement between the two is arrived at. This item-by-item reliability is considered to be stringent method for establishing agreement between judges. One can also follow a second but somewhat less stringent method for determining inter judge reliability where an overall comparison between two individuals judgment is made.

It might so happen at times that transcriptions are made by two or more clinicians independently but simultaneously with the final transcription arrived at by consensus. This procedure that typically involves a panel of examiners/clinicians listening to audio recorded responses is used in difficult to judge situations. No doubt independence of judgment is lost in such a procedure. Since phonetic transcription has excellent clinical utility, difficulty in arriving at high reliability shouldn't discourage neither the estimation of reliability nor the use of transcription. As the transcription forms the part of research in phonological disorders one should always consider the possibility of providing some sort of validation of one's accuracy by having another trained person transcribe the material.

It is also customary that besides knowing that one's judgments are in agreement with that of another, the clinician might want to know about his/her judgment consistency over time. A comparison of judgments made on two different occasions of the same sample establishes intra judge reliability. Higher reliability is an indication that the examiner is consistent in his/her judgments.

I.10. Transcribing the disordered speech

Transcribing the sounds produced correctly is somewhat a straight forward job provided the transcriber knows the phonetic values of the symbols. But the transcription becomes a bit difficult in case of disordered speech. In phonological disorders one finds clients to use the normal sounds of the language incorrectly. For instance a patient may use [t] in the place of [k]. But it is also possible that varieties of phonetic features that are not part of normal sound patterns of the language to occur in disordered speech. The variations can be observed to occur in the production of vowels as well consonants. We will discuss presently only those sounds that are rarely encountered in natural language or sounds that are never encountered in natural language but are specific to particular phonological disorder for which IPA symbols do not exist. It should be emphasized at

this pint that IPA over the years has been able to revise not only the symbols but also has given extended symbols and a range of diacritic markers that can be used along with the primary symbols

The deviation of sound production can be viewed in terms of its phonetic features. For instance the deviations in the consonantal category can be discussed with reference to air stream, voice, place and manner of articulations and the vowels in terms of front, back, high, low, rounding and spreading of lips.

As far as air stream and its direction is concerned there seem to be very little problem as most of the sounds and even individuals known to have speech problems use pulmonic egressive air. Pulmonic ingressive air can be occasionally found to be used in clients with fluency problem and rarely in phonological problems. In such cases the consonants so articulated with ingressive pulmonic air can be transcribed with a subscript [↓]. The other condition is in the case of esophageal speakers where the oral cavity air is employed for the production of speech sounds. For both these atypical speech no IPA symbol exist. But one can avail the extended IPA symbols.

Two phonation types, viz, voiced and voiceless are used in the formation of consonants. Among the consonantal categories whenever the voiceless/voiced cognates exist they are represented by distinct phonetic symbols. Since no specific phonetic symbols are given for the unvoiced nasals and laterals in IPA they are represented by the diacritic marker [°] and is written below the voiced sound.

Clinicians will agree that most of the disturbance in the consonants occur with reference to place of articulation. If a patient uses a place of articulation different from the target sound for which the symbols are not found in the IPA, then extIPA provides symbols to transcribe the deviation. But when ranges of place of articulation that are not found in natural language are observed in the client's speech, the transcription should be done with the aid of special diacritic marks. Some of the deviant place of articulation commonly found in the labial area includes linguo-labials, dento-labials and labio-alveolars. Similarly clinician may need to transcribe different types of consonants that are produced with tongue tip and back of the tongue.

It is unlikely that one will find many atypical manner of consonant articulation. The only noticeable feature that occurs frequently is reiteration, that is, rapid repetition of the sound or syllable with little pause as in the case of stammering or acquired neurogenic speech disorders. Another feature that has been reported (Ball 1995) refers to whistled fricative (may be noticed in cleft-lip-palate cases) which results due to introduction of very narrow grove of the articulators. These features are marked as [sa/sa/sa/] in the case of the former and with a subscript [↓] below the sound in the case of later.

Another interesting phonetic feature that one might observe in the disordered population is double articulation like alveolar-velar that are un-natural in languages. IPA provides symbols for double articulations and hence poses no problem. Similarly secondary articulations such as labialization, palatalization which are quite few phonological processes often observed in patients can also be transcribed. But a feature that definitely lacks any symbol is spread of lips contrast to labialization.

Students of phonological disorders often ignore disturbance to the vowel system. Since it is difficult to produce vowels out side the vowel area one doesn't find new places or types of vowels. But the

quality of vowel can definitely be affected as in the case of HI children or adults who have undergone glossectomy. Crystal's (1982) PROPH (profile in phonology) offers provision for recording them. Nasalisation, length, more advancement of the tongue, more rounding, retraction and rising of the tongue are some of the features one might observe to occur in the affected vowels.

I.11. The relevance of phonetic transcription

Transcription is used as a tool in the analysis of disordered speech. As pointed out earlier one has the option to employ either phonetic or transcription. The central issues concerning the two types of transcription in relation to speech pathology are: 1) is it necessary to maintain the distinction of phonetic and phonemic transcription while transcribing disordered speech? 2) if such a distinction is employed do they reflect in classifying speech disorders into phonetic and phonological disorders?

The distinction between phonetics and phonology is a well settled concept where the former is interested in describing the phonetic details of the sound production and perception and the later is concerned with the meaning differentiating function of the sounds. But one is not in a position to say definitely whether the terms phonetic and phonemic transcriptions are understood in the correct perspective and applied in phonological disorders. Though the two terms are not interchangeable, they are not always used precisely. The distinction between phonetic and phonemic transcription must be made very clear. While phonetic transcription records all the phonetic details or captures the allophones of a phoneme, phonemic transcription provides symbols to only the phonemes and ignores the allophones. The result is that only persons familiar with the phonology of the language could read accurately such a transcription. A patient with disordered speech will be exhibiting some degree of disturbance of the phonological patterns of his/her native tongue. As the phonology is disturbed it is not proper to do a phonemic transcription. Instead it is absolutely essential to employ phonetic transcription to capture the phonetic features.

I.12.Transcribing prosody

Speech pathologists have to identify and treat patients with disturbance in not only segmental categories of the speech but also in the suprasegmental domain. Breakdown in the segmental units would definitely lead to unintelligible speech, where as disturbance in the prosody would interfere with overall communication of the client. For instance inability to use pitch variation would affect both emotional and information that it might carry and hence the communication would turn out to be less effective.

Prosody includes features of pronunciation that are different from segmental sounds. Prosody constitutes part of our expression, whether at the word or sentence level. The prosodic features form part of every language though different languages exploit them in different ways. The set of prosodic features that might occur in the languages include length, pause, stress and pitch (tone and intonation).

It must be recognized that transcription of the speech behavior of individuals without noting the prosodic features is inadequate. While standard IPA and extIPA symbols are available for consonants and vowels, one can't say with the same confidence in the case of prosodic features. While there is no recognized IPA symbol for pause phoneticians use their own system for transcribing the same. For instance one can come across the use of single dot {.} for short pause and {…} in the case of long pause. In the case of stress one finds a set of three symbols for

recording the three degree of stress, viz, primary, secondary and tertiary. Transcribing intonation pattern is a bit difficult task as phoneticians employ different notational system for the transcription. Due to the above reasons one finds definite uncertainty as how to transcribe suprasegmentals. The clinicians must understand suprasegmental transcriptions if they have to fully understand speech disorders. It becomes obligation for the phoneticians to assist the clinicians to overcome this impasse and provide standard symbols for transcription.

I.13. The need of the hour: Phonetic Training

An inaccurate transcription will have damaging effect on the phonological analysis of the speech disorders. In view of the above it is advisable that the clinicians should acquire adequate training in transcription under the guidance of trained phoneticians. The phoneticians on their part should make concentrated effort to impart phonetic training and help clinicians perform phonetic transcriptions which will enable him to understand the phonological disorders in a better way. Another important task the phoneticians are expected to do is to provide standard symbols for the sounds for which symbols may not be found in the IPA for the segmental as well as suprasegmentals particularly with reference to Indian languages.

Appendix I

THE INTERNATIONAL PHONETIC ALPHABET (revised to 2005)

CONSONANTS (PULMONIC) © 2005 IPA

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k g	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap		ⱱ		ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

CONSONANTS (NON-PULMONIC)

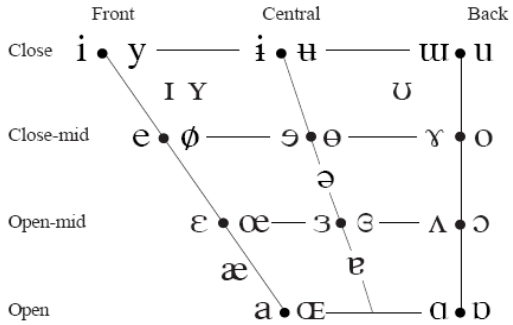
Clicks		Voiced implosives		Ejectives	
ʘ	Bilabial	ɓ	Bilabial	’	Examples:
|	Dental	ɗ	Dental/alveolar	pʼ	Bilabial
!	(Post)alveolar	ʄ	Palatal	tʼ	Dental/alveolar
ǂ	Palatoalveolar	ɠ	Velar	kʼ	Velar
‖	Alveolar lateral	ʛ	Uvular	sʼ	Alveolar fricative

OTHER SYMBOLS

ʍ	Voiceless labial-velar fricative	ɕ ʑ	Alveolo-palatal fricatives
w	Voiced labial-velar approximant	ɺ	Voiced alveolar lateral flap
ɥ	Voiced labial-palatal approximant	ʃʒ	Simultaneous ʃ and x
ʜ	Voiceless epiglottal fricative		
ʢ	Voiced epiglottal fricative		
ʡ	Epiglottal plosive		

Affricates and double articulations can be represented by two symbols joined by a tie bar if necessary. k͡p t͡s

VOWELS



Where symbols appear in pairs, the one to the right represents a rounded vowel.

SUPRASEGMENTALS

ˈ	Primary stress	ˌfoʊnəˈtɪʃən
ˌ	Secondary stress	
ː	Long	eː
ˑ	Half-long	eˑ
˘	Extra-short	ĕ
|	Minor (foot) group	
‖	Major (intonation) group	
.	Syllable break	ɹi.ækt
‿	Linking (absence of a break)	

TONES AND WORD ACCENTS

LEVEL			CONTOUR	
e̋ or ˥	Extra high		e̋ or ˩˥	Rising
é ˦	High		ê ˥˩	Falling
ē ˧	Mid		e᷄ ↗	High rising
è ˨	Low		e᷅ ↗	Low rising
ȅ ˩	Extra low		e᷄᷅ ↗˩	Rising-falling
↓	Downstep		↗	Global rise
↑	Upstep		↘	Global fall

DIACRITICS Diacritics may be placed above a symbol with a descender, e.g. n̊ŋ̊

◌̥	Voiceless	n̥ d̥	◌̤	Breathy voiced	b̤ a̤	◌̪	Dental	t̪ d̪
◌̬	Voiced	s̬ t̬	◌̰	Creaky voiced	b̰ a̰	◌̺	Apical	t̺ d̺
◌ʰ	Aspirated	tʰ dʰ	◌̼	Linguolabial	t̼ d̼	◌̻	Laminal	t̻ d̻
◌̹	More rounded	ɔ̹	◌ʷ	Labialized	tʷ dʷ	◌̃	Nasalized	ẽ
◌̜	Less rounded	ɔ̜	◌ʲ	Palatalized	tʲ dʲ	◌ⁿ	Nasal release	dⁿ
◌̟	Advanced	u̟	◌ˠ	Velarized	tˠ dˠ	◌ˡ	Lateral release	dˡ
◌̠	Retracted	e̠	◌ˤ	Pharyngealized	tˤ dˤ	◌̚	No audible release	d̚
◌̈	Centralized	ë	◌̴	Velarized or pharyngealized	ɫ			
◌̽	Mid-centralized	e̽	◌̝	Raised	e̝	(ɹ̝ = voiced alveolar fricative)		
◌̩	Syllabic	n̩	◌̞	Lowered	e̞	(β̞ = voiced bilabial approximant)		
◌̯	Non-syllabic	e̯	◌̘	Advanced Tongue Root	e̘			
◌˞	Rhoticity	ə˞ a˞	◌̙	Retracted Tongue Root	e̙			

extIPA SYMBOLS FOR DISORDERED SPEECH

(Revised to 2002)

CONSONANTS (other than on the IPA Chart)

	bilabial	labiodental	dentolabial	labioalv.	linguolabial	interdental	bidental	alveolar	velar	velophar.
Plosive		p̪ b̪	p͆ b͆	p͇ b͇	t̼ d̼	t̪͆ d̪͆				
Nasal			m͆	m͇	n̼	n̪͆				
Trill					r̼	r̪͆				
Fricative median			f͆ v͆	f͇ v͇	θ̼ ð̼	θ̪͆ ð̪͆	h̪͆ ɦ̪͆			ʩ
Fricative lateral+median								ʪ ʫ		
Fricative nareal	m͋							n͋	ŋ͋	
Percussive	ʬ						ʭ			
Approximant lateral					l̼	l̪͆				

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

DIACRITICS

͍	labial spreading	s͍	͈	strong articulation	f͈	͊	denasal	m͊
͆	dentolabial	v͆	͉	weak articulation	v͉	͋	nasal escape	v͋
̪͆	interdental/bidental	n̪͆	\	reiterated articulation	p\p\p	͌	velopharyngeal friction	s͌
͇	alveolar	t͇	͎	whistled articulation	s͎	↓	ingressive airflow	p↓
̼	linguolabial	d̼	→	sliding articulation	θs͢	↑	egressive airflow	!↑

CONNECTED SPEECH

(.)	short pause
(..)	medium pause
(...)	long pause
f	loud speech [{*f* laʊd *f*}]
ff	louder speech [{*ff* laʊdɚ *ff*}]
p	quiet speech [{*p* kwaɪət *p*}]
pp	quieter speech [{*pp* kwaɪətɚ *pp*}]
allegro	fast speech [{*allegro* fɑst *allegro*}]
lento	slow speech [{*lento* sloʊ *lento*}]
crescendo, ralentando, etc. may also be used	

VOICING

ˬ	pre-voicing	ˬz
ˬ	post-voicing	zˬ
₍̥₎	partial devoicing	₍z̥₎
₍̥	initial partial devoicing	₍z̥
̥₎	final partial devoicing	z̥₎
₍̬₎	partial voicing	₍s̬₎
₍̬	initial partial voicing	₍s̬
̬₎	final partial voicing	s̬₎
⁼	unaspirated	p⁼
ʰ	pre-aspiration	ʰp

OTHERS

(◌̲), (C̲)	indeterminate sound, consonant	(( ))	extraneous noise ((2 sylls))
(V̲), (P̲l̲.v̲l̲s̲)	indeterminate vowel, voiceless plosive, etc.	¡	sublaminal lower alveolar percussive click
(N̲), (v̲)	indeterminate nasal, probably [v], etc.	!¡	alveolar and sublaminal clicks (cluck-click)
( )	silent articulation (ʃ), (m)	*	sound with no available symbol

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Chapter II

Applicability of speech language transcription in communication and communication disorders

Dr. K. J. Ramadevi Sreenivas

II.1. Introduction

A detailed articulatory description of sounds can provide a reasonably good idea of what a spoken utterance sounds like. It is cumbersome to label each sound in terms of articulation. To provide a more efficient means of describing speech, phoneticians have devised a set of symbols, known as the International Phonetic Alphabet (IPA). IPA symbols are by convention enclosed in square brackets ([ ]). The International Phonetic Association was founded in 1886 in Paris. It continues to modify the alphabet in order to accommodate newly documented sounds.

There was considerable focus in the early years on the development of phonetic alphabet as there was practical language learning. The phonetic alphabet has developed in terms of use and in terms of sophistication. In terms of use, the IPA's alphabet has become the world's standard phonetic notational system. It is used not only in foreign language teaching, but also in speech recognition systems and representations of pronunciation for mother tongue speakers. Majority of the dictionaries have adopted IPA systems. For linguists the IPA's alphabet has become the default way of presenting foreign-language data. That is why it is important that linguistics students should be familiar with the IPA chart and have some ability to read symbols.

The most common transcription system to identify speech productions is the International Phonetic Alphabet (IPA) promulgated by International Phonetic Association, which includes a different symbol for each phoneme. In English language more than forty such symbols are utilized to identify the phonemes. The goal is to mention the important phonetic symbols, so that the student has working knowledge of basic transcription.

IPA	words
ʌ	cup, luck
ɑ:	arm, father
æ	cat, black
e	met, bed
ə	away, cinema
ɜ:ʳ	turn, learn
ɪ	hit, sitting
i:	see, heat
ɒ	hot, rock
ɔ:	call, four
ʊ	put, could
u:	blue, food
aɪ	five, eye
aʊ	now, out
oʊ	go, home
eəʳ	where, air
eɪ	say, eight
ɪəʳ	near, here
ɔɪ	boy, join
ʊəʳ	pure, tourist

IPA	words
b	bad, lab
d	did, lady
f	find, if
g	give, flag
h	how, hello
j	yes, yellow
k	cat, back
l	leg, little
m	man, lemon
n	no, ten
ŋ	sing, finger
p	pet, map
r	red, try
s	sun, miss
ʃ	she, crash
t	tea, getting
tʃ	check, church
θ	think, both
ð	this, mother
v	voice, five
w	wet, window
z	zoo, lazy
ʒ	pleasure, vision
dʒ	just, large

II.2. Types of transcription

Phonemic transcription

The broadest systematic transcription is a phonemic transcription, where the symbols stand for phonemes. Information about the occurrence of allophones of a phoneme is absent. The broadness of systematic transcriptions will vary according to purposes for which the transcriptions is being made. A phonemic transcription is less detailed than a phonetic transcription.

Phonetic transcription

A phonetic transcription is sensitive to sound variations within a phoneme class. It is much more detailed than phonemic transcription. It is usual for an impressionistic transcription to aim to be as narrow as possible. If the transcriber does not know anything about the speaker's phonological system then he or she should not start with any assumptions about which phonetic details will and will not be important. But when dealing with impaired speech in a language we cannot predict what will be impaired nor how it will be impaired. As a general principle, the less we can predict about some one's speech, the narrower and more impressionistic our transcription has to be. Knowledge of patient's condition does not help to predict the phonetic behavior. In "narrow transcription", we use different symbols. For example:

the "p" sound in *pin* and *spin* (the first is accompanied by more breathing)

the "w" sound in *wet* and *twice* (the first is voiced, the second is not)

the "flap t" and the regular "t" (the first is voiced and "flapped"; in narrow transcription it is usually denoted as t̬)

Diacritic markers

The level of accuracy of a transcription can be conceived as a continuum. At one end is the broad transcription, at the other end is the narrow transcription. A narrow transcription conveys as accurately as possible and therefore tries to capture as much detail as possible. A narrow transcription also includes diacritics as a way to provide additional detail. Diacritics are additional marks that can be attached to both consonant and vowel symbols to refine their description.

Diacritic markers are used to describe the speech of individuals whose speech sound production cannot be adequately described by broad phonetic symbols. For example, in assessing the phonological status of an individual with a cleft condition who is unable to achieve velopharyngeal closure for certain speech sounds, *diacritics* indicating nasal emission [snail] or nasalization [b n]may be useful in the description of the client's production of such segments. Similarly when assessing the articulation of an individual with impaired hearing symbols to indicate appropriate vowel duration [si:] for lengthened, devoicing [ ] and denasalization [r n] are recommended, if these characteristics are present in productions. Also with developmental articulation errors characterized by lateralization, dentalization and devoicing, diacritics should be used.

This broad transcription system supplemented with a set of diacritics usually provides sufficient detail for speech language clinicians to adequately describe speech sound productions. Ex: The broad transcription of word key, one would transcribe the initial segment with the symbol /k/. A more precise transcription would include the diacritic for aspiration [^{h}] following word-initial [k^{h}] because aspiration occurs in production of /k/ in word initial contexts.

Use of diacritics sometimes called a closed transcription system, allows for recording specific topographical dimensions of individual segments. Such a transcription system is recommended when broad transcription does not adequately describe the errors. An example of diacritics that reflects an error seen in disordered phonology is following: If /t/ in the word /tip/ dentalized, the diacritic for dentalization [̪] is placed under the /t/, thus [tip] if /s/ in the word /san/ is lateralized, diacritic for lateralization is placed under the /s/ thus [san].

II.3. Accuracy of transcription

Clinicians must be concerned with whether or not their transcriptions are a valid representation of a client's productions. In making transcriptions, clinicians rely primarily upon auditory perceptual judgements. It is important for clinicians to establish the reliability of their perceptual judgements.

Interjudge reliability- also called as point-to-point agreement. Clinicians have used agreement between two independent transcribers as a means of establishing reliability of judgements.

Intrajudge reliability- Comparison of judgement made when scoring the same data on two separate occasions. High reliability on such a measure is a indication that the examiner is consistent in his or her judgements.

II.4. Purpose of clinical transcription

In the phonetic and phonological analysis of atypical speech production the ultimate goal of subjecting an individual`s speech to scrutiny is to identify where, and understand how, it differs from the norms of the relevant language variety. Here, phonetic transcription is the first stage in the process of understanding the pronunciation systems and communication behaviors of speakers with impaired speech. Speech language professionals whose main focus is identification, diagnosis and management of speech, language disorders have to be well versed in phonetic transcription.

Phonetic transcription of atypical speech data is encountered with challenges and pitfalls. So it is important to take the view that a transcription need not be a final phonetic analysis but can be changed: "the process of producing any transcription is a cyclic one. There is no 'perfect' final transcription" (Ball & Local, 1996).

The difficulties associated with transcription for clinical purposes have led to some of the objections against using transcription which, are as follows:

Phonetic transcription is based on perceptual analysis which is inherently subjective, unreliable and limited by the constraints of perception.

Instrumental techniques provide more objective measures which are now-a-days widely available.

Phonetic transcription perpetuates the misleading view that speech comprises a linear sequence of discrete sounds.

The time it takes to transcribe could be better spent.

The first of these objections is an argument against listening to impaired speech at all. But it is only by listening, the effect an individual's speech impairment has on his or her spoken communication and intelligibility can be experienced. By bringing phonetic knowledge to the act of listening the process of analysis begins which leads towards phonetic explanations for the abnormalities that are heard. Transcription is a way of recording the results of moment-by-moment analytic listening which, when laid out on paper enables to see recurring patterns. This is the starting pointing for the phonological analysis of the data. The charges of subjectivity and reliability can be addressed to some extent through controlling the conditions under which transcriptions

are made, but undeniably constrained by the biological and cognitive limitations of perceptual abilities. As spoken communication takes place within these limitations, a perceptual tool exactly tailored to the natural conditions can be utilized. Phonetic transcriptions help to better target what to explore instrumentally.

As Ladefoged (2003) observes "instrumental aids can often illuminate particular points acting like a magnifying glass" but "the ultimate authority in all phonetic questions is the human ear".

The third objection raises a serious issue. Phoneticians have stressed repeatedly over many years that speech is certainly not a linear sequence of discrete sound segments and much phonetic research has focused on events that last over more than one identifiable sound.

The amount of time taken to make a good transcription is often a pressing issue not only in the clinical context, but also in research work where time is increasingly tightly constrained. It has frequently been argued that good transcription, a good initial analytical record, saves time at later stages by identifying and prioritizing those aspects of an individual's speech most in need of the clinician's or researcher's attention. Many scholars claim that valid and reliable phonetic transcription is central to the study and management of persons with communicative disorders.

II.5.Types of speech sample

In clinical phonetic analysis, the size, the kind of speech sample and glossability are important aspects. According to Grunwell (1987) at least 200-250 words should be collected. Lambert (1989) suggested 75-100 utterances, whereas Crary (1983) suggested 50. Many scholars stressed the need of connected speech sample. Grunwell advocates collecting real spontaneous speech. The most widely used sample in clinical assessment is single word picture naming, which is the most glossable kind of elicited speech. But it completely lacks the junctural phenomena of connected speech and gives no opportunity to observe rhythmic and intonational organization over more than a few syllables.

Some scholars noted cases of individuals with autistic spectrum disorders where creaky phonation relates to specific interactional and discourse behaviours. Ideally for transcription and phonetic analysis the transcriber should not know the speaker's lexical targets otherwise there may be bias in the judgement. The paradox is that glossing is an obstacle to phonetic analysis but a prerequisite for phonological analysis and for rating intelligibility.

II.6. Methods of transcription

The problems of subjectivity and unreliability can be tackled to a significant extent by controlling the conditions under which a transcription is made. The first necessity is to record the speech sample on a good quality recording system so that the transcription can be made from listening to, and preferably looking at, a high quality recording. Portable digital recorders are the best convenient recorders. Transcription of live speech is notoriously unreliable because it is impossible to write the symbols and diacritics down at the speed at which the speaker produces sounds. Every time cannot ask the speaker to repeat. Also, in live situations it is much harder to ignore the linguisitic aspects of the speech and to concentrate solely on the sounds.

According to Abercrombie (1958) when transcribing we use our eyes and not just our ears. Kelly and Local (1989) emphasize: "in doing phonetic transcription it is important to pay attention to at least part of what a speaker can be seen to be doing".

Silent articulation (mouthing) is potentially an important phonetic behavior in impaired speech which will not be evident on audio recordings, but there are other features as well that can only be reliably captured on video or film.

Modern technology and computer software have increased the range of recording, storing and listening conditions for transcription. There are options of free-field listening, listening through ear buds, various designs of earphone, listening at different speeds without a change of pitch and even to listen to speech backwards. Any of these may be done to get a accurate picture of the phonetic structure of the speaker's output.

Sell, Harding and Grunwell (1999) in a discussion of the transcription of speech production associated with cleft palate, advocate the use of different symbols for active and passive nasal fricatives, stating that the two articulations may be "perceptually indistinguishable but they are distinguishable by the manner in which they are articulated". Comparing listener-oriented and speaker-oriented transcriptions can reveal interesting instances of non-correspondence where something sounded like x but seems to have produced as y. Valuable insights into the relationship between a client's intelligibility, articulation strategies and underlying phonological system are to be gained by studying such non-correspondences closely. In addition, instrumental analysis and perceptual analysis should not be seen as competitors but as complementary.

How many times one should listen to an item is another choice the transcriber has to make. Shriberg, Kwaitkowski and Hoffmann (1984) are wary of too much sensory exposure and advise listening no more than three times to items.

The clinical transcriber is at a disadvantage when compared to the field worker who can copy an informant's productions and then ask if they are acceptable. A further choice for the transcriber is whether to rely solely on his or her own judgements or to ask phonetically competent listeners to make transcriptions of the same data. Shriberg, Kwaitkowski and Hoffmann (1984) suggest four consensus procedures and seventeen consensus rules for such a situation. Although some of these are potentially problematic, many are helpful in resolving disagreements. Use of different symbols and diacritics by different transcribers to represent the same analysis is something all experienced transcribers will be familiar with. It emphasizes the fact that a transcription has to be made and interpreted within a framework of phonetic theory.

The commonest system of transcriptions in use for clinical and research purposes is the roman – alphabet- based notation of the international phonetic alphabet (IPA). The most recent revision of the system was in 2005. A set of symbols for use especially in the transcription of impaired, officially adopted by the International Clinical Phonetics and Linguistics Association (ICPLA) in 1994, is known as Ext IPA (extensions to the IPA). Ext IPA provides a set of symbols which can capture unusual places of articulation as well as a range of unusual phonatory, resonatory and air stream behaviors. Transcriptions of non segmental aspect of speech such as pauses, stress, intonation, speech rate and loudness is done using IPA and Ext IPA symbols. Voice quality symbols (VoQS) are ext IPA set to which IPA numbers are assigned in the 1999 IPA handbook.

The main difference between the American tradition and IPA lies in differences in the symbols use to transcribe vowels. In the American traditions,

fewer vowel distinctions are generally made, so where IPA treats the members as different vowels APA usage tends to treat these as notational variants of a single vowel. Another significant difference between the two systems is the difference in terminology are classifying vowels note that a three way division into high, mid and low vowels is assumed in the American system, with sub-divisions into tens and lax sets, where as in the IPA, a basic four way division into close, close-mid, open-mid and open vowels is adopted. Because phonology views speech sounds symbolically, knowledge of the system of symbols for representing speech is a pre requisite to doing a phonological analysis. It is also vital to know the phonetic parameters for describing the sounds of human languages. The main characteristics of vowels involve fronting of the tongue (front, central and back), rounding, and vowel height (high, mid and low with tens and lax variants of high and mid vowels). Other properties of vowels include stress, tone and the phonation types.

II.7. Speech language transcription

Phonetic and phonemic transcriptions are extensively used in the field of communication and communication disorders. Transcription utilized in the field of speech language sciences and speech language disorders may be named as speech language transcription. Speech language transcription has wide applications. This is employed whenever any clinical work or research work is carried out in the field of articulation, fluency, voice and language.

There are wide variety of speech and language disorders such as adult language disorders, child language disorders, misarticulation, fluency disorder, voice disorder, and so on. There are many assessment tools both screening and diagnostic which helps in the identification of the disorder, throws light on the degree of the disorder and directly or indirectly guides the kind of rehabilitation to be undertaken. In each of these aspects speech language transcription plays an important role.

In evaluation of speech and language disorder, transcription is essential in order to analyse the client's recorded responses as correct or incorrect. Also, the type of errors can be studied. Rating of the responses is done, many a times based on transcription.In addition, transcription helps to evaluate the progress of therapy given for any particular speech and language disorder. when pre and post tests are administered, not only the progress of therapy can be known, but also provides information about efficacy of the therapy technique employed.

Appendix II

Sl. No.	Test material used	Research carried out by	Implication
1	The speech -in-noise test and the dichotic CV test. The recognition of speech-in-noise was done using the Speech identification test for children developed by Vandana (1998) and the dichotic CV test was administered using the test material developed Yathiraj (1999) in Kannada.	James, A.A. & Yathiraj, Y. (2003)	Children with otitis media with effusion in early childhood are at risk for developing auditory processing problems.
2	The recognition of speech-in-noise was done using the Speech identification test for children (List 1) developed by Vandana (1998). Also the word sequencing test was developed from the words from the second list of the Speech identification test for children, Vandana (1998). The length of the word sequence increased from a three word sequence to an eight word sequence. Recalling words and recalling words in the correct order both were scored.	Janet,D. & Yathiraj, Y. (2003)	Musically trained children showed enhanced speech-in-noise scores, recalled more words and had better sequencing ability.
3.	PB word list (list A and list B) in Kannada, developed by Vandana (1998). A set of five questions related to daily activities was also utilized.	Sah, P.K. and Manjula,P.	Better performance was observed in speech recognition score both4 in direct and indirect listening conditions and on telephone conversation. Usefulness of transcranial CROS has been assessed in clients with unilateral hearing loss.
4	The material used consisted of two lists A and B, each containing 72 Consonant Vowel syllables.	Moumita,C. & Yathiraj, A. (2004)	The study evaluated the extent to which variation in the CV intensity ratio could account for variation in speech intelligibility in adults with hearing impairment and also checked whether it would have any effect on the perception of normal hearing adults.
5	Kannada paired word list was used to obtain speech recognition threshold and standard speech identification list in Kannada was used to obtain speech identification score.	Peter, V. & Vanaja, C. S.	The difference between ASSR threshold and behavior threshold was higher in subjects with auditory dys-synchrony than that observed in the control group. There was a very correlation between speech identification score and SL at which ASSR to low modulated rate was obtained.

Appendix II contd….

6	The material used in dichotic CV test was consonant vowel pairs. The list consisted of 30 standard pairs of the syllables /pa/, /ta/, /ka/, /monosyllabic wordsa/, /da/ and /ga/.	Sindhuja & Barman, A.	The study concluded that the long term mobile phone and landline phone use may not affect the lower brainstem, but may be at risk for getting some physiological changes at the higher brain stem level.
7	Two lists of twenty-five bisyllabic (List A and List B) words each were constructed for SRT testing in Oriya. All the phonemes of the language were included in each of the lists. Two lists (List 1 and List 2) of fifty monosyllabic words each were constructed for speech identification testing in Oriya. The phonemic balance was maintained in each of the lists, which was done based on the frequency of occurrence of phoneme in Oriya.	Smeeta, B. & Yathiraj, A.	Assessing speech perception abilities of an individual constitute an important part of hearing evaluation. Speech recognition threshold and speech identification tests were constructed in Oriya.
8	To evaluate the effect of aging on auditory processing both behavioral and electrophysiological tests were employed. These included duration pattern test and speech perception in noise, which consisted of words.	Peter, V. & Vanaja, C. S.	It was observed that older adults with or without normal hearing had difficulty in understanding speech, which is attributed to auditory processing deficits.
9	The auditory learning manual developed in Kannada contains 5 sections. Each section has 1 to 5 lessons. Further each lesson has one to six lists. These lists contain meaningful words comprising of low, mid and high frequency consonants and vowels. Simple phrases, sentences and stories were also constructed.	Vijayalakshmi, C.S. & Yathiraj, A.	Developed manual would be useful in training hearing impaired children improve their auditory perceptual skills.

Appendix II contd…

Sl. No.	Test material used	Research carried out by	Implication
1.	104 meaningful minimal pairs in Malayalam with consonants contrasting in initial and medial positions.	George, J. and Savithri,S.R.	Malayalam monolinguals and Malayalam bilinguals scored higher on perception of stop consonants and affricates compared to Hindi monolinguals. Speakers of Hindi language have difficulty in perceiving differences in phonemes that are not present in their language.
2.	The material comprised of two lists of Arcane English words, List I -10 trisyllabic English Arcane words, List II - 10 bisyllabic English Arcane words. A set of 20 questions were framed for each of the Arcane English words. A set of five words which served as phonological priming cues for each target word (100 words) was prepared. These words were semantically unrelated to the target but shared at least one phonological feature with the target word.	Khanna,K. & Manjula, R.	The gesture priming group obtained better scores than the phonological priming group for the percentage and number of word retrieval.
3	The study aimed at evaluating reading and phonological awareness skills. Reading readiness test and metaphonological tests included reading, vocabulary, visual discrimination, auditory discrimination, metaphonological tests, rhyme recognition, syllable reversal, syllable deletion, syllable oddity,phoneme reversal, phoneme deletion and phoneme oddity	Namratha,M. &Prema, K.S.	Children with hearing impairment performed best in rhyme recognition and poorer in syllable level tasks. It was observed that better reading skills coexisted with better phonological awareness.
4	A resource manual for remediation of children with reading disability in Malayalam has been developed and has been field tested.	Ponnumani,S. & Prema, K. S.	As per the study, training on syllable skills and phoneme skills is mandatory during remediation. The study set a hierarchy of skills as follows: rhyme recognition, syllable deletion, syllable reversal, phoneme oddity, phoneme segmentation, phoneme deletion and phoneme reversal for children who learn to read and write Malayalam.

Appendix II Contd…

5	The manual developed for the treatment of children with Development Apraxia of Speech consists of two main sections: Section A consists of two chapters targeting errors in vowel and consonant production including exercises for improving oral motor control. Section B consists of three chapters targeting specific errors found in word production.	Vani, R. & Manjula,R.	The developed manual guides clinicians, parents, or caregivers in the treatment of children with Development Apraxia of Speech.
6	Developed Computerised Linguistic Protocol for Screening (in Kannada) comprises of a set of four pictures containing line drawings in each of the following categories: lexical categories, antonym, polar questions, syntagmatic relationship, paradigmatic relationship, semantic similarity, semantic anamoly, semantic contiguity, plurals, affirmative-negative forms, interrogartives, person-number-gender, transitives, intransitives, causatives, conditional clauses, conjunctions, comparatives, quotatives, case markers, tenses, participial, construction.	Anitha, R. & Prema, K.S.	CLiPS can be used as a screening tool to identify children with language disorder. Stimuli can be used to screen non-Kannada speakers.
7	The test battery included Kannada language test, Reading readiness test, Kannada articulation test and test of pragmatic skills.	Chaudhary, B. K. & Shyamala, K. C. (2004)	The test battery helps to arrive at a detailed assessment profiling, identification and diagnosis of children with SLI and thus providing directions to its management.
8	The developed manual in Hindi has five main sections, Functional communication, Repetition, Comprehenion & expression, Naming and Independent series.	Deshpande, R. & Goswami, S. P.	The manual was developed in Hindi for the treatment of non-fluent aphasics.
9	Items included in the remedial manual are rhyme recognition, syllable deletion, syllable reversal, syllable oddity, phoneme deletion and phoneme oddity.	Shilpashri, H. N. & Prema, K. S.	A remedial manual on metaphonological skills in Kannada was developed for children with reading disability.
10	To investigate cognitive-linguistic deficits in Kannada speaking individuals with traumatic brain injury CLAP was administered. CLAP developed by Kamath (2001) comprises of domains such as attention, discrimination and perception; memory; problem solving and organization.	Tiwari, S. & Goswami, S.P.	Adults with TBI showed poorer performance on different domains of CLAP.

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