

Full Length Research Paper

Pathology of Speech: Aims and Causes

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Abstract

The purpose of this study is to refer to the complications producing speech sound or problems with voice features. These problems can be characterized by break in the flow or rhythm of speech, for example, disfluency. Moreover, they can be problems with the way sounds are uttered such as articulation, phonological disorders or may be difficulties with the volume, pitch or quality of the sound. People with speech disorders have troubles using some speech sounds, which can also be a sign of a delay. Problems with communications and perception differ in nature and severity from person to person. Some of these difficulties are dysarthria, apraxia and echolalia.

Keywords: Speech disorders, Speech pathology, Broca's aphasia, Wernick's aphasia, stuttering.

INTRODUCTION

Speech disorders refer to problems in communication and related areas such as oral and motor function. These delays and disorders range simple sound substitutions to the inability to understand or use language or use the oral motor mechanism for functional speech and feeding. Some children with speech impairments have difficulties in understanding language, in using, or both using and understanding language.

Many children have specific problems that do not seriously affect their language functioning. This means that a child may not have problems related to language form and/or function, but may have verbal expressions which are objectionable to listeners and which inference with message reception and processing by listeners. The objectionable behavior of speech is subtle. The problem calls for important behavioral changes. This may include specific articulation defects. (Substitution a /w/ for an /r/), voice disorders, including breathiness, nasality, hesitations in speech production (stuttering).

PATHOLOGY OF SPEECH: AN OVERVIEW

Penfield and Roberts (1959) discovered that when an electrical current was applied to a brain area involved in speech, one of the two things occurred: the patient either has a trouble talking or uttered a vowel –like cry. However, no patient ever produced an intelligible word as a result of electrical stimulation (Akmajian et al., 1997: 504). The problem would, perhaps, be easier to resolve if agreement existed on which areas of the brain are especially reasonable for language. But the location is agreed on only in outline, the details remain very controversial.

In the majority of human being's language is located in the left half of the brain Akmajian *et al.*, 1997 (see figure 1). Within this, the production of speech is controlled mainly by forward portions of the brain, in an area traditionally known as Broca's area, after the 19th century French neurologist Paul Broca, who in 1861 wrote a paper in which he claimed that a patient with damage to the frontal area was only able to produce the word 'tan', though he was able to comprehend speech. Speech comprehension, as such, is located towards the back of the brain's left side in an area called Wernicke's area, after another 19th century neurologist, this time German,

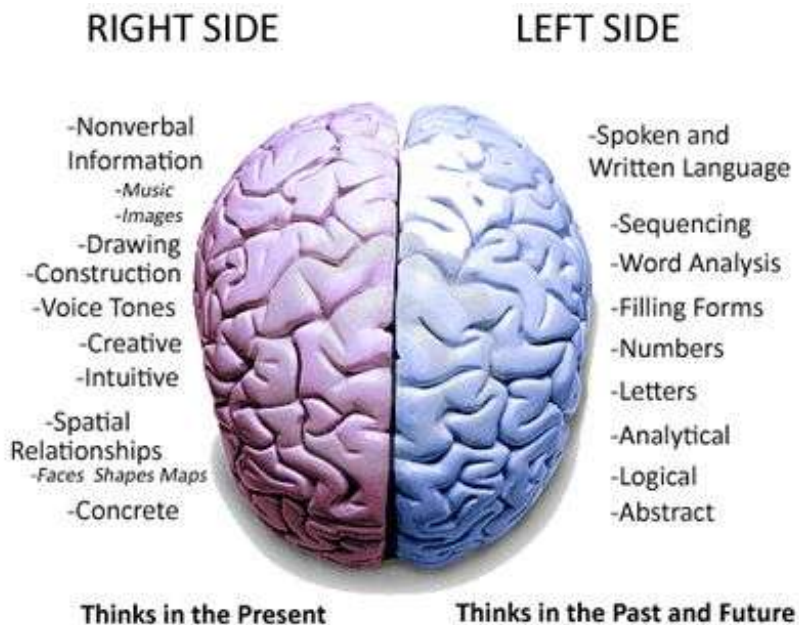


Figure 1. Complementary specialization of cerebral hemispheres

who in 1874 published a paper showing the importance of the rear of the brain for understanding language. Since then, however, experiments have shown that there is considerable variation within humans that damage to these areas do not always result in impairment predicted. Nowadays, there is more emphasis on the links between different areas of the brain, and the way in which information is carried via neuro-transmitters, than on identifying the precise locations for language activity (Finch, 2000: 198).

SPEECH AND SPEECH PATHOLOGY: DEFINITIONS

Speech is the process or result of producing continuum meaningful sounds in a language (Hartmann and Stork, 1973: 215). Speech behavior includes three broad categories: articulation, rhythm, and voice. These three can be explicitly evaluated. Deviations in these categories represent the bulk of the work done by speech clinicians (Haring and Schiefelbusch, 1976: 272). Sanders (1972: 56) believes that it is more appropriate to begin articulation training with /t/ or /s/ phoneme, for instance (which occur relatively frequently in spontaneous speech) in contrast to the phoneme, such as /ʒ/ (the final sound in the word 'rouge'), which occurs infrequently.

He adds that the best way is to train missing or disordered phonemes in the order in which they are normally acquired. This may serve as a guide to planning a development training sequence in speech Baker and Ryan, 1972. Speech pathology, also termed speech-language pathology and speech and language therapy

is the study of disorders that affect a person's speech, language, cognition, voice disorders (Wikipedia Encyclopedia, 1996:2). Hartmann and Stork (1973: 215-216) point out that speech pathology is "the study of defects and disturbances that may impede the communication effectiveness of a speech". Fry (1979:11) adds that common speech and language disorders include an inability to understand what others say, an inability to produce sounds correctly, stuttering and voice disorder.

On the other hand, Den Renzi *et al.*, (1966:51) define disorder by stating "the inability to perform voluntary movements with the muscles of the larynx, pharynx, tongue, and cheeks, although automatic movements of the same muscles are preserved.

AIM OF SPEECH PATHOLOGY

Speech pathology aims at finding the causes of such disorders: damage speech organs, neuromuscular and sensory defects or psychological upsets. It is worth stating that a thorough knowledge of the acoustic and articulatory phonetics as well as the psychological, anatomical and linguistic bases is required (Hartmann and Stork, 1973:216). The speech pathologist may assist vocational teachers and counselors in establishing communication goals related to the work experiences of students and suggest strategies that are effective for the important transition from school to employment and adult life. Further, technology can help children whose physical conditions make communication difficult. The use of

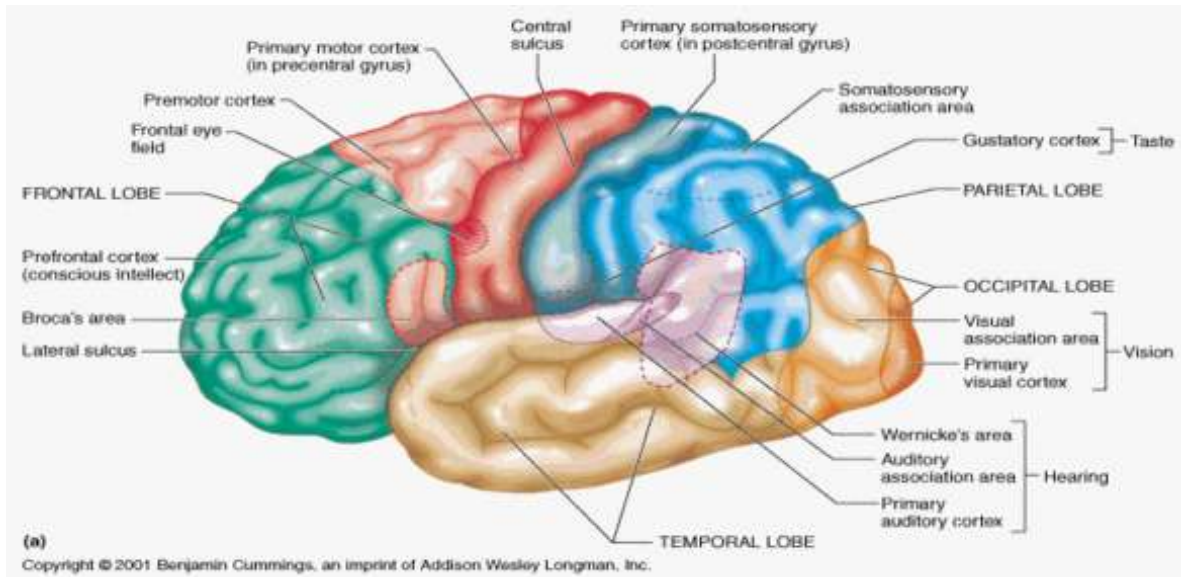


Figure 2. The Brain

electronic communication systems allows nonspeaking people and people with severe physical disabilities to engage in the give and take of shared thought (Haring and Schiefelbusch, 1967: 282).

CAUSES OF SPEECH PATHOLOGY

Aphasia

It is in general the impairment of the inability to use language, particular grammar and vocabulary, usually caused by some form of damage to the brain, sometimes accompanied by other forms of impairment, consisting of types such as Broca's and Wernicke's aphasias (Cook, 1997:1)

Aphasia may co- occur with speech disorders such as dysarthria or apraxia of speech, which result from brain damage. Usually, aphasias are a result of damage to the language centers of the brain (like Broca's area). These areas are always situated in the left hemisphere, and in most people this is where the produce and comprehend language is found (see figure 2). However, in a very small number of speeches, language ability is found in the right hemisphere.

Damage to these language areas can be caused by a stroke, traumatic brain or other head injury. Aphasia may also develop slowly, as in the case of a brain tumor. Depending on the area and extent of the damage, someone suffering from aphasia may be able to speak not write, or vice versa, understand more complex sentence than he/ she can produce any of a wide variety of other deficiencies in reading, writing, and comprehension (Akmajian *et al.*, 1997:546-547).

Common types of Aphasia

Aphasiologists have no uniform criteria for classifying types of aphasia, the consequence of which is considerable terminological diversity. Widely accepted are Broca's aphasia, Wernicke's aphasia, conduction aphasia and anomia (Akmajian *et al.*, 1997: 517). Broca's aphasia is a type of aphasia characterized by loss of ability to produce, but not comprehend speech, associated with injury to Broca's area in the front left hemisphere of the brain (left frontal lobe).

Individuals frequently speak in short, meaningful phrases that are produced with great effort. Broca's aphasia is thus characterized as a non-fluent aphasia. Affected people often omit small words such as 'is', 'and', and 'the'. For example, a person with Broca's aphasia may say, (walk dog) meaning, (I will take the dog for a walk). The same sentence could also mean (you take the dog for a walk), or (the dog walked out of the yard), depending on the circumstances (Wikipedia Encyclopedia, 1996: 3).

Individuals with Wernicke's aphasia usually have great difficulty understanding speech and are therefore often unaware of their mistakes. These individuals usually have nobody weakness because their brain injury is not near the parts of the brain that control movements: posterior upper temporal lobe (Cooke, 1997:13). Anomic aphasia is the partial or total loss of the ability to recall the names of persons or things (Ibid.). The sufferers may have difficulties naming certain words, limited by their grammatical type (e.g., difficulty naming verbs and not nouns) or by their semantic category (e.g., difficulty naming words relating to photography but nothing else)

or more general naming difficulty. Sufferers are usually aware and are comparable to a 'tip of the tongue' sensation experienced by most people (Wikipedia Encyclopedia, 1996: 3).

Generally, Broca's aphasia is primarily a defect in the phonological component of language, Wernicke's aphasia affects the semantic and syntactic components. The lateral sulcus separating Broca's and Wernicke's areas may represent a neuroanatomical boundary separating the phonological from syntactic and semantic components at the cortical level. It must be pointed out that Broca's and Wernicke's areas are connected sub-cortically by a bundle of nerve fibers called the (arcuate fasciculus). This may serve a transmission line carrying signals received in the auditory reception cortex to the auditory association cortex for interpretation and, subsequently, to the speech production cortex for verbalization (Akmajian et al., 1997:520).

Stuttering (disfluency)

Trask (1996:341) states that stuttering refers to the unintentional repetition of segments or syllables in speech, especially word initial consonants, either from a speech defect or from the strong emotion (G-G-G 'Good Morning'). Stuttering is difficult to summarize because it involves several kinds of non-fluency that vary considerably from speaker to speaker (Crystal, 1985: 280; Espir and Rose, 1976: 41-42).

1). The most widely recognized symptom is the abnormal amount of repetition of sounds, syllables, words, or phrases (e.g., P-P-P 'please'), (he's got a -got a - got a - got a - car).

2). Sometimes sounds are lengthened abnormally, (e.g., see; where initial scan last several sounds, often with an uncertain rhythm.

3). The extra words are introduced at points of difficulty, (e.g., 'oh', 'gosh')

4). Words and phrases may be left unfinished

5). Speakers may avoid words and sentences that contain the sounds they find difficult and replace these by circumlocution. One stutterer, who had read difficulty with [p], word always replaces 'policeman' by 'officer of the law'.

6). There is abnormal intonation and speed of speech.

Factors that improve stuttering are: speaking in unison, modifying the voice by singing, whispering, acting or using different pitch, repetition of the rhymes (Espir and Rose, 1976:43).

Dysarthria

Is the difficulty of speech? This is due to a lesion in the nervous system or in muscles concerned. Speech is distorted, weak, slurred and explosive (Playfair, 1993:78,

Gleason, 1997:27).

Aphonia

Trask (1996:28) states that this term is the total loss of the ability to use the vocal fold in order to produce phonation. Roach (2002:23) points out that aphonia (dysphonia) is "a general term used for disorders of voice; the word voice here should be taken to refer to the way in which the focal folds vibrate", Dysphonia is a result from infection (laryngitis), from a growth on the vocal folds (e.g., a polyp), from over use (hoarseness) or from surgery.

Apraxia

Is an often severe difficulty in controlling voluntary movement of limbs or vocal organs. In particular, there may be an inability to control sequences of sounds (articulatory apraxia) or gestures (Crystal, 1985:273).

Dyslexia

Is the impaired ability to read and write words correctly? This is generally a congenital condition resulting from both lesions. (Playfair, 1993: 79). Concerning (deep dyslexia), people are unable to read new nonsense words, but in addition they make many semantic errors (e.g., reading "forest" as "tress". There are also several types of difficulty, including function words (e.g., "for" as "and", "his" as "she"). Words with concrete (as opposite to abstract) meanings are easier to read. There are also visual difficulties (e.g., reading "signals" as "single"). There is also a problem with homophones (e.g., one person understood "burry" as "a kind of hat"). In addition, people seem dependent upon using grapheme-phoneme conservation rules; whole word spelling is impaired though not entirely lost (e.g., one person spelled "yacht" as "yaght", showing some visual recall) (Crystal, 1985:274).

Voice Disorders

Voice disorders are a nontechnical term applied to any irregularity in the vocal production of speech: also called defective phonation (Good, 1973:188). Voice handicaps are classified into disorders of phonation (the vibration of the vocal folds); and disorders of resonance (the vocal tract is thought of as a continuous tube with different dimensions at different places along its length (Roach, 2002: 65). The first type manifests itself mainly in abnormal qualities of pitch and loudness: such as very monotonous, high-pitched, or weak voices; and in a range of breathy, husky and hoarse effects that are labeled dysphonia. The second type is best shown from the many abnormal nasal resonances which can affect the voice: some excessively nasal, some with reduced nasality

('blocked nose') (Crystal, 1985: 278).

The majority of voice disorders, however, has a non-physical, 'functional' cause. For example, emotional stress can itself be sufficient for people to 'lose their voice', resulting in a range of psychological conditions which require lengthy and sympathetic investigation and therapy if they are to be resolved. Factors of this kind may also have physical consequences. Nodules and ulcers result from 'vocal abuse' which causes chronic dysphonia. But the reasons for the abuse are functional, arising out of the life style of the speakers; in particular, it is very common for nodules to form in those who live by their voice – singers and teachers, and who are regularly faced with vocally demanding situations (Ibid.)

It is worth stating that the key to voice pathology is to teach a person to make good use of his possibilities, even if the quality of the voice is limited by organic damage. It implies intensive practice at all levels of nervous system organization. The sufferer will be guided in finding the best possible adjustment to the changed conditions. In case, of habitual dysphonia, the sufferer is taught to become aware of emotional tension and its effect on breathing and phonation. Then practice ways to free himself from involuntary that blocks the airflow and interferes with free phonation (Hibbert, 1997:6).

Cleft Palate

Is a congenital permanent opening between the roof of the mouth and the nasal cavity. The sufferer's speech is characterized by strong and persistent nasalization (Trask, 196: 74). Cleft palate or lip has very serious consequences because the condition affects not only the development of speech, but also the ability of a child to eat. The palate has an extremely important role during speech because when we talk, it prevents air from blowing out of your nose instead of the mouth (Crystal, 1985:267).

Cleft palate and stuttering are patently production handicaps, but in both cases, problems of reception case can be found: a significant proportion of cleft palate children have an additional hearing loss; and stutters may be so involved in the problems of fluency control that their ability to listen and comprehend may deteriorate (Ibid.).

Cognition Problems

The process of knowing; in particular, the process of knowing based on perception, introspection, or memory (Good, 1973:113). A person may have difficulty with orientation, memory / recall, judgment, organization of thoughts, or slowed thought processing. Difficulty with aspects of cognition affects one's ability to communicate (Hipchen, 2005:2). Cognition refers to thinking, it includes an awareness of one's surroundings, sustained attention to tasks, memory, reasoning, problem

solving, and executive functions like goal setting, planning, initiating, self-awareness, self-inhibiting, self-monitoring and evaluation, and flexibility of thinking, cognitive difficulties are most common in persons who are traumatically brain injured and these problems vary depending on the location and severity of the injury to the brain (Jackson, 202: 3).

Persons frequently have trouble concerning when carrying on a conversation in a noisy restaurant or dividing attention among multiple tasks. The processing of new information is slower and longer messages may have to be broken down into smaller pieces. The person also may have to repeat incoming messages to make sure she or he has processed the crucial information and communication partners may have to slow down their rate of speech to help the person process. Recent memory is affected, making the new learning difficult, but long-term memory for events and things that occurred pre-injury is generally unaffected (Ibid.)

Clinical linguistics

It is the investigation of speech disorders, i.e., aphasiology (Finch, 2000:196). Hartman and Stork (1973:38) point out that "clinical linguistics refers to the use of special techniques from the fields of medicine and linguistics to study and treat speech defects and language disorders". Such defects may be due to physical disability from birth, to accident or illness, or to psychological disturbances. The linguistic sciences can help by providing theoretical models, analytical techniques and descriptive data about language as a whole, the relation between speech and writing, articulation and classification of speech sounds, grammatical and semantic relations, etc.

Varshney (1992:11-12) adds that a linguist observing like a scientist observes his data. Some of his methods of observation include simple listening, phonetic transcription, and the use of different instruments such as oscillography, soundspectrograph, laryngoscope, breathing flask, pitch meter, speech stretcher, etc. Records and cassettes made in these ways constitute various kinds of objective description. Therefore, a linguist has his language laboratory too.

Speech clinicians consider articulation defects, that is, problems in the production of speech phonemes of a language, constitute the largest single category of speech disorders (Haring and Schiefelbusch, 1976: 283).

CONCLUSION

Speech pathology refers to difficulties producing speech sounds or problems with voice quality. It might be characterized by an interruption in the flow or rhythm of speech, such as disfluency. Speech disorders may be

problems with the way sounds are formed (articulation or phonological disorders), or they may be difficulties with the pitch, volume or quality of the voice. There may be a combination of several problems. People with speech disorders have trouble using some speech sounds, which can also be a symptom of a delay. They may say 'see' when they mean 'ski' or they may have a trouble using other sounds like 'l' or 'r'. Listeners may have trouble understanding what someone with a speech disorder is trying to say.

Also, people with voice disorders may have trouble with the way their voices sound. The different forms of aphasia show that representation of linguistic functions in the left hemisphere is by no means uniform or equal. We have seen in this paper that lesions in different areas of the left hemisphere lead to distinct aphasia syndromes. Problems with communication and cognition vary in nature and severity from person to person. Some of these difficulties are dysarthria (in coordination of the lips, tongue, throat and jaw), apraxia (poor voice quality, discoordination of breathing and voice, incorrect pronunciation of sounds, inability to initiate conversation, perseveration), echolalia (repeating back what has just been said, difficulty with turn-taking in conversation, stuttering, and difficulty reading and writing).

NOTES

1). In as much as each cerebral hemisphere has unique functional superiorities (summarized in figure 1), it seems inappropriate to refer to the language –dominant left hemisphere as the major one. It is more accurate to conceive of the hemisphere as complementary specialized. The degree of hemisphere specialization, however, varies among individuals. Right –handed individuals who have a family history of right-handedness will show the greatest hemisphere specialization. Less likely to show hemisphere specialization are left –handed individuals with a family history of left handedness. (Akmajian et al., 1997:514).

2). For more information the reader may refer to Baker and Ryan (1972) "Programmed for Articulation". Behavior Sciences Institute, Monterey, Calif.

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