

Phonological Disorder Noticed in People Suffering from Structural Dysarthria- An Analysis on their Ability to Communicate in Telugu

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Abstract:

Language proficiency is an indispensable necessity for humans. Man is a social animal, we live together and formed societies, and our success depends on the way we communicate and interact within the society. We bestowed with the unique ability to acquire language naturally. The learning process starts early, especially during childhood, but few children are not fortunate enough with their instincts as they suffer from speech disability disorders like dysarthria. Dysarthria is a speech disorder that weakens the cerebral system and as a result, reduces the learners' ability to communicate. This paper emphasises the learnability of people suffering from Dysarthria, with a particular emphasis on acquiring their mother tongue Telugu. An investigation has been done by using a set of questionnaires to identify the possible errors that the dysarthria people make while speaking the Telugu language.

Keywords: speech disorders, Dysarthria, Phonological disorder, Articulation Disorder

1. Introduction

Language is the most essential means of communication. Humans are born with a special ability to acquire language naturally and this acquisition of language takes place even more naturally and effortlessly during the critical period of every child. However, not all children are endowed with the ability to acquire language and articulating speech sounds understandably well. Such children are said to be born with speech disability or disorders, of which dysarthria is one.

The reduced communicative intelligibility, comprehensibility, and naturalness can be the results of dysarthria, which is characterized by irregularities in force, pace, variety, point in time, and/or precision of articulatory motions induced by injury to the neurological system. (Mackenzie, C., & Lowit, A. (2007).

It is evident that from the above information, dysarthria is one of the speech disorders, which causes disturbance of speech patterns. Therefore, it is very important to work on the speech of the dysarthric and find out the speech-related problems while speaking. The present study, with a brief introduction to the general characteristics of the Telugu language in general and their phonological aspects in particular which are relevant to the present study, presents a comprehensive picture of literature done on the phenomenon so far to emphasize the need for carrying out this research.

Under the present empirical study, an attempt has been done to scientifically analyze the speech patterns of Telugu Dysarthrics using a theoretical framework for better efficacy. It examines the phonetic aspects of dysarthric patterns of speech systematically in terms of phonemes and creates a basis for any possible clinical intervention. Finally, this research contributes to language therapists and sets the stage for further research.

1.1 Telugu

One of the South Indian Dravidian languages is Telugu. It ranks 13th on the ethnological list of the most widely spoken languages in the world and has the third-highest number of native speakers in India. It is the official language of the states of Telangana and Andhra Pradesh. Both states' native language is Telugu. Furthermore, it is also spoken in the other southern states like Karnataka, Tamil Nadu, and central Indian states like Orissa, and Chhattisgarh. Telugu is recognized as one of India's 22 scheduled languages. It belongs to India's classical languages as well.

Due to the recent bifurcation of the Andhra Pradesh state, Telugu geographical scenario has changed. The state was divided into two states by the government of India Andhra Pradesh and Telangana. Telugu is the official language of both the states. The Andhra Pradesh state has got two dialects such as coastal Andhra and Rayalaseema whereas the Telangana state has got the only dialect which is called Telangana dialect. Despite Telugu being the majority language spoken in both states, there are considerable dialectal differences.

1.2 Telugu Phonology

Language, a mechanism in itself, is in general studied at various levels to understand its structural and phonological patterns of it. The indivisible sounds or phonemes combine to constitute a unit which may refer to an object. Thus, every language consists of a certain set of phonemes which may form syllables and then morphemes which in turn become tone groups. These sound units have regular patterns. Every language, with its own set of phonemes native and also borrowed, stands different even from its other genetically related languages. Therefore, the speech sounds are language specific.

Since the present work chiefly concerns the phonemes of Telugu and their articulation, it becomes a requisite to know the fundamental phonological patterns of Telugu. Telugu, along with its own rich set

of native phonemes, borrowed many aspirated sounds from Sanskrit for the borrowed Sanskrit words to be represented. The prominent characteristic feature of Telugu phonology is that every consonant will have an inherent vowel in it and thus every word ends in a vowel sounding euphonious. And it is this feature which made scholars from the West call it ‘*The Italian of the East*’ since Italian words also end in a vowel. Some of the eminent scholars who carried out highly valuable research on the phonology of Telugu are Brown, C.P. (1857), Kostic, D., Mitter, A., & Krishnamurti, B. (1977), Prakasam, V. (1972), Sastry, J. V. (1972), Scott, J. R. (1972) and others.

Telugu Vowels and Diphthongs

Telugu language has 12 vowels: 10 Monophthongs and 2 Diphthongs. **Monophthongs:** /ɪ, i:, e, e:, a, a:, ʊ, u:, o, o: /

Diphthongs: /aɪ/ and /aʊ/

Figure

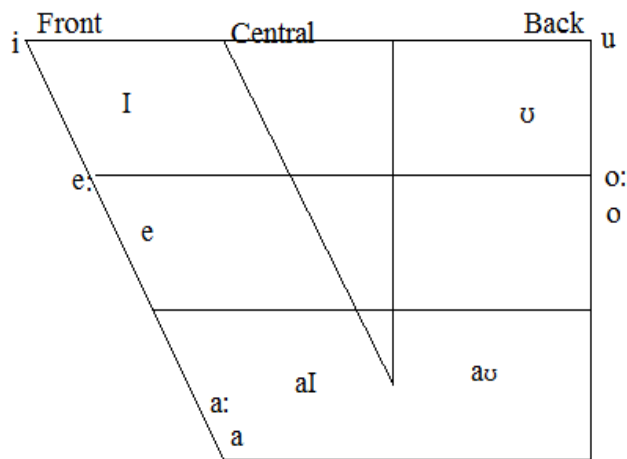


Figure 1.1 Telugu Vowels and Diphthongs

Telugu Consonants

There are 33 consonants found in Telugu. They are split into 6 types based on their articulation styles. They are given below.

Plosives: /p, p^h, b, b^h, t̪, t̪^h, d̪, d̪^h, t̪ʳ, t̪ʳ^h, d̪, d̪^h, k, k^h, g, g^h/

Nasals: /m, n, ŋ/

Trill: /r/ (it can also be realized as flap /r/))

Fricatives: /f, s, ʃ, ç, h/

Affricates: /tʃ, tʃ^h, dʒ, dʒ^h/

Approximants: /l, l̪, j, v /

Consonants Chart of Telugu

Place	Bilabial	Labio dental	Dental	Alveolar	Retroflex	Palatal	Velar	Glottal
Manner								
Plosive	p b p ^h b ^h		t̪ d̪ t̪ ^h d̪ ^h		t̪ d̪ t̪ ^h d̪ ^h		k g k ^h g ^h	

¹ The phoneme has the retroflex manner also in its production (as shown in the IPA chart).

Nasal	m			n	ɳ			
Trill				r				
Fricative		f		s	ʃ	ç		h
Affricate						te dz te ^h dz ^h		
Approximant		v				j		
Lateral approximant				l	ɭ			

Table 1.1 Telugu Consonants

Influence of Telugu Phonology on English Phonology

At the outset, it is a well-known phenomenon that there is no one-to-one correspondence between the orthographic representation and the pronunciation in English. In other words, English is not a phonetic language where the pronunciation does match the spelling, whereas Telugu is phonetic and is spoken as it is written. It is, in fact, this conception, which drives most Telugu speakers of English to follow the correspondence in their oral reading or speaking English, which is a major stumbling block to learning English pronunciation. In the English phonological system, some letters in some particular phonological environment are not phonetically realized which are called silent letters. For instance, here are two English words below.

a) **Psychology** /saɪkɒlədʒɪ/

b) **Disappear** /dɪsəpɪə/

In (a), the word *psychology* has / P / which is silent and so it is not realized phonetically in the English sound system. In (b) too, the word *disappear* has the letter / r / which is not realized phonetically in isolation. Thus, there are several words in English in which certain letters will not have any phonetic content in the pronunciation.

2. Significance of the study

This research aims to analyze the Telugu speech sounds pronounced by different dysarthric informants. The students were chosen from various educational institutions and some clinics in Hyderabad. The dysarthric informants have Telugu as their mother tongue. After recording the disordered speech samples, they were analyzed in terms of their auditory and acoustic properties. For some important cases in this analysis, acoustic help has also been taken from PRAAT, speech analysis software. The study dealt with the cases where impaired people go wrong in their utterances in Telugu. The objectives of the study especially focus on **di** and **tri-syllable** words uttered by these dysarthric informants. These testing materials were given to these informants for reading. Certain feedback was also taken from each informant to arrive at an understanding of what sort of physical deformity each participant has.

2.1 Research Methodology

Coming to analysis, the analysis is mainly based on the auditory perception of the data samples. As observed in the research, the possible errors in impaired speech are addition, omission, substitution, prolongation of sounds shortening of sounds, gemination, improper consonant clusters and imprecise consonants, etc. This study also examined some special features such as metathesis and malapropism.

Moreover, the study throws light on some spectrographic analyses of the deviant features. Therefore, the study can be considered as a scientific study. According to the need for communication, this study is essential to know the articulatory dissimilarities. This study attempted to provide a clear classification of speech sounds and their phonological patterns used by dysarthric people. It can be considered to be useful to bring awareness about particular speech difficulties of dysarthric. It may help pathologists and therapists with the common patterns of dissimilarities of pronunciation.

2.2 Informants

This study included a total number of 15 participants. They are all diagnosed with dysarthria. These informants were chosen from Durgabai Deshmukh Vocational Training and Rehabilitation Centre, National Institute for Mentally Handicapped, Sweekar and Upakaar Rehabilitation Centre, Kims Hospital and Anurag Rehabilitation Centre.

For the present study, fifteen informants (eight men and seven women) provided the data for analysis. The informants were within the age group of 13 to 40 years. All of them are native speakers of Telugu language. Speakers with mild level dysarthria were chosen for the study. These informants can read and speak. All the informants were reported to have a history of different types of dysarthria. They had problems with the functional abnormality of the oral mechanism or nasal obstruction. It was confirmed that the informants were not suffering from respiratory or motor track infections at the time of testing. After taking these measurements, the recording was done for the data collection. The details of clinical information of each speaker were collected on a separate information sheet. The following is an example of the format.

Information Sheet

Details of the Speaker

- Name of the Speaker :
- Institution :
- Place of Residence :
- Father’s Name :
- Mother`s Name :

Causes for Dysarthria (Pathologist`s Feedback)

	Yes	No
1) Cerebral palsy:	<input type="checkbox"/>	<input type="checkbox"/>
2) Brain injury:	<input type="checkbox"/>	<input type="checkbox"/>
3) Stroke:	<input type="checkbox"/>	<input type="checkbox"/>
4) Surgery for head and Neck cancer:	<input type="checkbox"/>	<input type="checkbox"/>
5) Haemorrhage:	<input type="checkbox"/>	<input type="checkbox"/>
6) Alcohol or Drug use:	<input type="checkbox"/>	<input type="checkbox"/>
7) Brain Tumour:	<input type="checkbox"/>	<input type="checkbox"/>
8) Road Accident:	<input type="checkbox"/>	<input type="checkbox"/>
9) Damage to Cerebral control unit circuit:	<input type="checkbox"/>	<input type="checkbox"/>
10) Damage to the lower motor Neurons:	<input type="checkbox"/>	<input type="checkbox"/>

Researcher’s Observation:

Physical deformities	Emotional behaviour	Personality
Tongue thrusting	Depression	Introvert

2.3 Text Material

The reading material (word list) for this research was prepared in a systematic order. This is a well-prepared word list to draw out deviant speech patterns. In the preparation of the list, the three phonological positions i.e. initial, medial, and final of each phoneme are covered. As already mentioned that the study is limited to only di and tri-syllable words, the list is also prepared in the same format. The Telugu word list is also prepared in a systematic order. In this word list also three phonological positions are covered. The list of words is given to the informants randomly. The words which are currently used in day-to-day conversations are included in the list, in addition, a few words which are infrequent in general context are also included in the list to cover all the phonemes. This decision was taken in order not to miss any phonemes.

2.4 Word List

The word list consists of 2 subdivisions: Telugu di-syllabic words – 63 and tri-syllable words -59. The total number of Telugu words is 122.

Table No. 1, 2, 3 and 4 below indicates the Word List

Table 2.1 Telugu Di-Syllabic Words

1) ala	22) dhara	43) tho:mu
2) kala	23) gadha	44) praanam
3) aavu	24) ancu	45) sasi
4) paata	25) chadi	46) jari
5) aathaa	26) tuccam	47) dhanda
6) geeta	27) enda	48) latha
7) khadgam	28) sega	49) vepa
8) reekha	29) nuune	50) fanr
9) illu	30) eeru	51) kaafi
10) vinu	31) jata	52) yama
11) ghattam	32) nijam	53) kaaya
12) megham	33) aidu	54) badi
13) uri	34) kaidi	55) kaksha
14) iiga	35) muppai	56) bhasha
15) kaasii	36) takku	57) sare:
16) uuka	37) thaavu	58) poosa
17) rushi	38) dappu	59) haami
18) cali	39) konda	60) guha
19) kantha	40) daaka	61) kshoba
20) aunu	41) onte	62) sharaa
21) kaulu	42) o:da	63) guuba

Table 2.2 Telugu Tri-Syllabic Words

1)	kadava	21)	falamu	41)	runamu
2)	alaka	22)	oopika	42)	vairamu
3)	khari:dhu	23)	dawada	43)	nalubai
4)	mukhamu	24)	dhanassu	44)	vifalam
5)	aakali	25)	uuyala	45)	baruvu
6)	chiraaku	26)	pu:jaari	46)	abala
7)	thanakaa	27)	jalaja	47)	bhayamu
8)	godugu	28)	jumkaaram	48)	laabhamu
9)	ghanamu	29)	ruthuvu	49)	samadhi
10)	meghamu	30)	takkari	50)	aushadham
11)	isuka	31)	vantari	51)	maunamu
12)	shikaaru	32)	kantamu	52)	andhamu
13)	eeswari	33)	eruvu	53)	mandhamu
14)	rachana	34)	thelupu	54)	yamudu
15)	chalokti	35)	parige	55)	tha:lamu
16)	acchikam	36)	e:nugu	56)	kshanamu
17)	urimi	37)	tho:delu	57)	himamu
18)	mo:kshamu	38)	dabbulu	58)	shanaga
19)	gathamu	39)	damaru	59)	aashalu
20)	okati	40)	fidelu		

3. Evaluation and Assessment of various Speech Disorders

Broadly, Speech disorders are classified into two types for linguistic purposes.

- Articulation Disorders
- Phonological or Phonemic Disorders

3.1 Articulation Disorders

In articulation disorders (i.e.phonetic disorders) people have difficulty producing the proposed phonemes. These conditions affect the primary articulators, which include the tongue, lips, teeth, alveolar ridge, hard palate, velum, and glottis. An articulation disorder involves one or more of these articulators in some way. These kinds of distortions are generally found as omissions, additions, and substitutions in the disordered speech. They are often paid attention in practical sessions of teaching.

3.1.1 Signs of Articulation Disorder

An *articulation disorder* involves problems in producing sounds. Sounds can be substituted, left off, added or changed. These errors are usually difficult for people to understand. Due to such articulation disorders, people often make speech errors. For instance, the / **f** / sound may be pronounced as [p^h] sound in a word (e.g., /vifalam/as[p^halam]). In the same way, the sound / **r** / may be pronounced as / **b** / (e.g., /roṇamu/ as /boṇamu/). Sometimes some phonemes may be removed entirely from a word (e.g., [g^hattam] as [g^hatt(a)]).

3.2 Phonological or Phonemic Disorder

People who suffer from a phonemic problem, also known as a phonological disease, may find it difficult to pronounce certain phonemes in the Telugu language. Some Telugu speech sounds and consonant clusters can be found to be difficult in uttering. For instance, the sounds / ɳ / and / kʃ / are uttered simply as / l / and / k / or / ʃ /. Some people find it challenging to master the language's sound structure. Finding it difficult to recognize the difference between particular sounds (for example, / l / and / ɳ /) which bring contrast in the meaning is one such trouble. Some other erroneous instances are also possible to be made by some speakers. For instance, the sounds / k / and / s / may not be identified as diverse phonemes; as a result, the words “kaalu” and “saalu” shall be considered by some speakers as homophones by pronouncing “kaalu.” This phenomenon is considered phoneme collapse. In such cases, the sound represented by / k / might be replaced by / t /, / k /, and / g / (replacement with other plosives). In the same way / r / may be pronounced as / l /. In many cases, dysarthric people use IPA sounds of Telugu instead of RP phonemes of English. Because of this, there are frequently more incorrect sounds than usual pronunciation errors. The most frequent mistakes, according to observation, are replacements. Using minimum pairs often reveals phonemic abnormalities.

4. Findings

These are the Telugu phonemes commonly are shown under mispronunciation by informants.

- The length of the front long vowels / a : / and / i : / is shortened by 50% of the speakers. For instance, in the word [a:ɖa:], the long vowel / a : / is rendered as / a / in the final position as in [a:ɖa]. In this study, some cases have observed that the length of / a : / is shortened when it is preceded by a voiced dental plosive. In the word /i:ga/, / i : / is demonstrated as / l /. The instance of the uttering may be related to a sudden urge to speak as observed during the recording.
- The front short vowels such as / a /, / l / and / ʊ / are lengthened by 40% of the speakers. For instance, the word [gi:ɖa] is demonstrated as [gi:ɖa:] in the final position. The word /ha:mi/ is rendered as /ha:mi:/ and the word /e:ɾʊ/ is rendered as /e:ru:/. It is observed that elongation happens mainly in the medial and final positions of these speakers.
- Diphthongs / aɪ / and / aʊ / are monophthongized as / a : / by the dysarthric. For instance, in the word /vaɪramʊ/, the diphthong / aɪ / is monophthongized as / a : / in the medial position by 25% of the speakers (the word /va:ramʊ/ can be found in Telugu as a different word). Therefore, they tend to simplify their pronunciation, but the very simplification can be realized entirely as a different word. Same as the case mentioned above, in the word /kaʊlʊ/, / aʊ / is pronounced as / a : / in the medial position by 30% of the speakers. When /kaʊlʊ/ is pronounced in a way of simplifying the word, it was uttered as /ka:lʊ/, which is entirely a different word in Telugu.
- Aspirated sounds such as [p^h, b^h, t^h, d^h, k^h, g^h, tɕ^h, dʒ^h] are unaspirated in their production in all three positions (initial, medial and final) by 90% of the speakers. However, the deaspiration of the phonemes does not cause any change in the meaning.
- 50% of the speakers pronounced / f / as / p /. For instance, the words /fiɖe:lʊ/ and /ka:fi/ are uttered as /piɖe:lʊ/ and /ka:pi/ respectively in the initial and medial positions. It is noticed that it happens when / f / is followed by the front short vowel / l / in a phonetic environment.
- The retroflex nasal / ɳ / is replaced with alveolar nasal / n / by 28% of the speakers. For instance, in the word /pra:ɳam/, / ɳ / is replaced with / n / in the medial position.

- Alveolar trill / r / is comprehended as a flap / r / when it occurs in intervocalic positions. For instance, in the word /sara/, the alveolar trill /r/ is realized as flap / r / by 70% of the speakers.
- Retroflex lateral approximant / ɭ / is pronounced as alveolar lateral approximant / l / in the medial position by 100% of the speakers. For example, in the di-syllabic word /kaɭa/, /ɭ/ is pronounced as /l/ and the replacement of / ɭ / with / l / brings about a change in the meaning of the word /kaɭa/. So they have opted for / l / instead of / ɭ /. This type of replacement is observed only in disyllabic words but not in tri-syllabic words.
- Palatal fricative / ç / is rendered as / s / or / ş /. This is observed in the initial and medial positions of the target words by 50% of the speakers.
- The consonant clusters / kʂ / and [kɭ] are simplified to one of their elements. For instance, the word /kʂo:ba/ is rendered as either /ko:ba/ or /ʂo:ba/ by 70% of the speakers and the word [tɛ^halo:kɭ] is rendered as either [tɛalo:tɭ] or /tɛalo:kɭ/ by 40% of the speakers.
- The dysarthric speech patterns such as Addition, Omission, Substitution, Consonant Clusters and Gemination are found to be difficult for intelligibility.
- A few special features such as Metathesis and Malapropism have been identified in the renderings of 28% of the speakers.

Through this study, it is suggested that the dysarthric speakers must be given some drilling for the above-mentioned phonemes.

5. Conclusion

The present paper throws light on the findings of the study carried out with specific reference to the target dysarthric speakers. Based on the phonetic analysis of the speech samples collected from the target dysarthric speakers, the findings of the study have been arrived at with specific reference to Telugu phonemes. The scope of the findings is limited to the 15 target dysarthric speakers and their renderings of the words given to them focus on the occurrence of the target phonemes of Telugu in the initial, medial and final positions of the target words. The phonemic features that are identified are omission, addition, substitution, Malapropism etc. This topic can be further extended by adding new phonemic features and by bringing new language responses as a part of further research. Finally, this research contributes to language therapists and also sets the stage for further research.

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