

**EFFECT OF LANGUAGE FAMILIARITY ON THE ASSESSMENT OF
STUTTERING BEHAVIOURS BY SPEECH LANGUAGE PATHOLOGISTS
ACROSS INDIAN LANGUAGES**

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May 2019

CERTIFICATE

This is to certify that this dissertation entitled “**Effect of language familiarity on the assessment of stuttering behaviors by speech-language pathologists across Indian languages**” is a bonafide work submitted in part fulfillment for the degree of Master of Science (Speech-Language Pathology) by the student holding Registration Number 17SLP010. This has been carried out under the guidance of a faculty member of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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DECLARATION

This is to certify that this dissertation entitled “**Effect of language familiarity on the assessment of stuttering behaviors by speech-language pathologists across Indian languages**” is the result of my own study under the guidance of Dr. Anjana B. Ram, Assistant Professor, Department of Speech-Language Pathology, All India Institute of Speech and Hearing, Mysuru, and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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DEDICATED TO APPA.....

AMMA.....

AKKA.....

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Chapter 1

Introduction

Speech has been given immense importance and considered as a messenger of knowledge which is capable of expressing one's inner abstract thoughts, emotions, hidden feelings, and unseen ideas. Thus, any disruption in this powerful mode can bring about dissatisfaction and a sense of inferiority in any individual. Stuttering is one such condition of disruption in forward flow of speech.

Many researchers have tried to define stuttering from different perspectives. In most of the definitions stuttering has been defined mainly with a focus on its visible/overt characteristic features such as repetitions, prolongations and blocks that generally characterize the stuttered speech (stuttering like dysfluencies) whereas, the focus of other definitions has been more on the speaker's perspective and reaction of Person with stuttering to his or her own stuttering problem.

According to Guitar (2006) any unusual frequent disruption which may include repetitions (phoneme, syllable, or word), prolongations and blocks is called as stuttering.

A standard definition of stuttering considered as one of the most comprehensive definitions was proposed by Wingate (1964). He defined "Stuttering as 1. (a) Disruption in the fluency of verbal expression, which is (b) characterized by involuntary, audible or silent, repetitions or prolongations, namely: sounds, syllables, and words of one syllable. (c) Usually these disruptions occur frequently or are marked in character and (d) are not readily controllable. 2. The disruptions are sometimes (e) accompanied by accessory activities involving the speech apparatus, related or unrelated body structures, or stereotyped speech utterances. 3. Also, there are no infrequent (f) indications or report of the presence of an

emotional state, ranging from a general condition of ‘excitement’ or ‘tension’ to more specific emotions of a negative nature such as fear, embarrassment, irritation, or the like. (g) Some incoordination expressed in the peripheral speech mechanism is the immediate source causing stuttering”.

ICD 10 states that stuttering is characterized by frequent repetition/ prolongation of sounds/syllables/words, frequent hesitations or pauses that disrupt the rhythmic and continuous flow of speech (WHO, 2007)

Van Riper (1982) stated that “stuttering occurs when the forward flow of speech is interrupted by a motorically disrupted sound, syllable, or word, or by the speaker’s reactions thereto”. According to him, stuttering is a condition in which speech is produced inappropriately in time which also includes reaction of an individual towards his or her stuttering. Thus, stuttering refers to a problem in speech planning, patterning, coordination, and reaction of the person who stutters toward his or her speech impediment.

Tanner, Belliveau, and Siebert (1995) tried to put together the primary and secondary features of stuttering and defined stuttering, as “any condition where an individual improperly patterns phonemes, syllables, words and/or phrases in time, experiences classically-conditioned negative emotional reactions to disfluent speech and associated stimuli, and who may engage in visible avoidance or escape behaviors when confronted with disfluent speech or associated stimuli”

Since India is a multilingual country, there appears to be an increasing interest among speech-language pathologists in the assessment and treatment of clients with linguistic backgrounds different from their own. Indeed, nowadays as a result of cultural diversity, clinicians have more possibility to see clients who speak an unfamiliar language. Speech language pathologists working with people speaking languages different from one’s own have

greater possibility of misinterpreting data collected for analysis, leading to possible misdiagnosis of speech or language disorders (Finn & Cordes, 1997; Van Borsel, Maes, & Foulon, 2001). The assessment of speech of persons who speak an unfamiliar language poses particular challenges (Williams & McLeod, 2012)

Chapter 2

Review of Literature

Stuttering is considered as a fluency disorder in all cultures and languages (Bloodstein,1995; Shapiro et al., 2004). Thus stuttering behaviors agreed upon by speech - language pathologist in every language is the same. International Classification of Diseases (ICD) 10 states that stuttering is characterized by frequent repetition/ prolongations of sounds/syllables /words, frequent hesitations or pauses that disrupt the rhythmic and continuous flow of speech (WHO, 2007). Stuttering is usually quantified using counts of different types of dysfluencies associated with stuttering or discrete events of stuttering (Cordes & Ingham, 1994; Yairi,1997).

Regardless of which classification is used to diagnose, the basis for finding the defining behavior(s) is still by perceptual judgment.

Two central questions arise regarding the assessment of stuttering:

- (1) How well are clinicians able to make reliable and valid judgements about the presence of stuttering in languages other than their own
- (2) Which are the determining factors in such judgements (Finn & Cordes , 1997)

Only few studies have been done in the evaluation of stuttering in an unfamiliar language, and most of these focused on the importance of familiarity with the language to be judged. The reliable interpretation of stuttering has been shown to be a difficult perceptual judgment task. Even among recognized authorities (Cordes & Ingham, 1995; Kully & Boberg, 1988) or experienced clinicians (Brundage, Bothe, Lengeling, & Evans, 2006), there is evidence of considerable disagreement over judgments of stuttering (Cordes & Ingham, 1994). Those disagreements occur despite the clinician's familiarity with the speaker's language.

2.1 Diagnostic indicators of stuttering/dysfluent speech

2.1.1 Speech characteristics

The speech fluency was defined by Starkweather (1980) in terms of rate, continuity, effort, and articulation.

a) Continuity in speech

This refers to the extent to which sounds, syllables and words are smoothly arranged in speech. There can be various behaviors that may disrupt the smooth flow of message in speech such as repetition, pauses (filled and unfilled), incomplete sentences and revisions. Thus, an interrupted message may be perceived as disfluent to the listener when the speaker is unable to maintain continuity in his/her speech.

b) Rate

The second dimension of fluency is *rate*. In a continuous flow of speech, usually the length of words varies as there are words which are longer than others and having more sounds. A normal speaker can maintain the rate of speaking at constant rate of information flow. The rate of speech is usually measured in syllables per minute (SPM) or words per minute (WPM). For a normal speaker, the preferred rate of speech is considered to be between 115-165 WPM and 162-230 SPM, on an average (Guitar, 2006).

Speech rate is considered as a measure to determine the treatment outcome in stuttering (Ingham & Cordes, 1997). A reduction in the rate of speech of adult PWS results in an increase in fluency as reported by many authors (Adams, Lewis, & Besozzi, 1973; Onslow & Ingham, 1987; Van Riper, 1973; Zebrowski & Kelly, 2002). A normal fluent speaker speaks at a rate of 167 WPM, whereas, for a PWS 123 WPM is the average speaking rate (Darley, 1955)

A study was conducted by Savithri, Jayaram, Kedarnath, & Goswami (2006) to determine the rate of speech and reading in four *Dravidian* languages (*Dravidian* languages are Indian languages, spoken mostly in southern states of India). The authors reported the rate of speech in adult speakers (age range of 16 to 50 years) to be 383 to 448 SPM and 115 to 135 WPM in Kannada; 346 to 388 SPM and 120 to 135 WPM in Tamil; 476 to 535 SPM and 116 to 130 WPM in Malayalam; 367 to 422 SPM and 105 to 132 WPM in Telugu.

c) Effort

The third aspect of fluency is the effort while speaking. An easy, effortless or relatively less effortful sounding speech is one of the prominent features of a fluent speaker

The two primary indicators of excess physical effort could be tension and struggle while speaking. It is reported that PWS often exhibits excessive tension in tongue, lip, jaw, and throat which subsequently reach to the head and neck region, and other parts of the face. Also, some struggling signs are visible in PWS (eg. sometimes pushing their tongues with pressure) when they are unable to say the intended word.

These overt symptoms in stuttering usually disrupt the airflow and result in excessive effort while producing a speech sound (Denny & Smith, 1997; Peters, Hietkamp, & Boves, 1994; Van Riper, 1982). As a result, their speech might sound irregular, rough and dysrhythmic

d) Speech naturalness

All the above speech parameters are considered as good contributors for determining “perceptually natural” speech. The speech *naturalness* is one of the crucial measures in comparing the speech of those who stutter with those who do not stutter

According to Parrish (1951), the concept of naturalness as a desirable speech behavior suggests its significance in distinguishing between natural speech production and perceptually natural sounding speech as a speaker and listener judgment

Schiavetti and Metz (1997) stated that the listeners can utilize their own perceptual internal standards to define the concept of speech naturalness in an individual.

Martin, Haroldson, and Triden (1984), in an experiment on Delayed Auditory Feedback, developed a reliable scale for rating speech naturalness consisting of a nine point rating where, '1' was considered as "highly natural sounding speech" and '9' as "highly unnatural sounding speech". They found that both groups of speakers who stuttered with and without delayed auditory feedback sounded significantly less natural than the normal speaking class.

2.1.2 Type of disfluencies

Yairi and Ambrose (1992) found Johnson's eight disfluency types and proposed a composite classification system where the different types of disfluencies were divided into two different categories such as:

1. *Stuttering-like disfluencies* (SLD) which included single-syllable, part-word repetition, prolongations and tense pauses or blocks (disrhythmic phonation)
2. *Other disfluencies* (OD) which included multisyllabic word or phrase repetition, interjections, revisions, hesitations or incomplete phrase.

He also suggested that SLDs are stuttering related disfluencies whereas ODs are those disfluencies which are observed in normal speakers as well.

2.1.3 Non-speech characteristics in stuttering:

Certain features beyond those of the speech abnormalities can be seen very frequently in stuttering called as secondary behaviors. These *secondary behaviors* are commonly assumed to be learned behaviors. However, to consider them "secondary" doesn't mean these features necessarily occur secondly, but they stand second in significance compared to stuttering like dysfluencies because these behaviors are not universal in the observable symptoms of stuttering (Spiller, 2001).

Secondary behaviors occur due to either fine motor control system deficit or increased tension in muscles related to speech (Lanyon (1978)

Wingate (1964) classified the non-speech behaviors under the headings of:

- (a) **Speech related movements:** This category embraces those exaggerated or inappropriate movements of the peripheral speech mechanism associated with the difficulty in uttering speech. (Eg: pursing the lips, protruding the tongue, clenching the teeth and the movements)
- (b) **Ancillary body movements:** It includes all other kinds of body action occurring in association with difficulty in uttering speech, such as eye blink, jerking the head, clenching fists, etc. Often these features give the appearance of intentional struggle and thus are assumed to be learned reactions

According to Sheehan (1975), any facial grimacing, fixed articulatory postures and fear during speech or anticipation of speech failure prior to speech attempts are some of the additional non-speech behaviors, resulting in the analogy of stuttering as an iceberg. These overt behaviours of stuttering are likened to tip of an iceberg that rises above the water level and its submerged portion is likened to the covert behaviours of an individual with stuttering which are considered to be more destructive. These associated behaviors vary from individual

to individual and change over time (Ambrose, Cox, & Yairi, 1997; Poulos & Webster, 1991; Smith & Kelly, 1997; Van Riper, 1982).

2.2 Measures of stuttering

There have been various studies where the researchers have suggested essential components to be considered during the assessment of stuttering. The importance of inclusion of different measures to assess speech and non-speech characteristics in stuttering evaluation has been recommended in many studies.

Curlee (1993) suggested that the following measures are the most essential components for detailed assessment of stuttering.

1. Measure of stuttering frequency (percentage of syllables or words stuttered).
2. Rate of speech in syllables or words per minute.
3. Speech naturalness ratings.
4. Severity of stuttering by administering a standardized scale such as the Stuttering Severity Index-SSI given by Riley (1994).
5. Non-speech aspects of stuttering.

Guitar (1998) suggested that for an assessment to be called ideal, it should include three major aspects related to stuttering i.e., *Core behaviours* (frequency, duration, rate and type of stuttering), *Secondary behaviours* (avoidance, coping strategies and physical concomitants), and *Affective aspect of stuttering* (self-perception, attitude, feeling and anxiety level).

2.3 Assessment of Stuttering by Speech Language Pathologists

Although stuttering is a disorder that has been known for ages and is recognized worldwide as one of the major human communication disorders (Wingate, 1997), the identification of stuttering is not always easy. Studies by Curlee (1981), Kully and Boberg

(1988), and Ingham and Cordes (1997) have shown that even trained professionals often do not agree when they have to identify stuttering dysfluencies in speech samples.

Kully and Boberg (1998) investigated the agreement in the identification of fluent and stuttered syllables across 26 clinics in Australia, Canada, England and the United States. They were asked to count the total number of syllables in each sample, the number of stuttered syllables in each sample and rate of each speaker on a seven-point stuttering severity scale, on ten speech samples of which eight were stuttered speech and two were normal. Significant inter-clinic differences were seen in all three domains, suggesting that the stuttering agreement varied within clinicians across different regions probing way to find out the factors leading to such judgements.

2.4 Factors influencing assessment of stuttering in foreign languages

Cosyns, Einarsdóttir and Borsel (2015) investigated the possible factors involved in the identification of stuttering severity in a foreign language. Nineteen speech-language pathologists from five different countries (i.e. Iceland, Sweden, Norway, Finland, and Belgium) rated stuttering severity of speech samples of persons who stutter, speaking Icelandic, Swedish, Norwegian, or Dutch. This study suggested that identification of stuttering in a foreign language focused on language familiarity. However, language familiarity is not the only factor involved. It is an interconnection between stuttering severity of the client, closeness of the clinician's language to that of the client, familiarity of the clinician with the client's language, and experience of the clinician and stuttering severity of the client.

2.4.1 Language familiarity:

Humphrey (2004) took six bilingual English-Spanish speaking and six monolingual English speaking Speech Language Pathology graduate students for a study to analyse two narrative video samples one in English and one in Spanish. Both bilingual and monolingual clinicians found greater percentage of disfluencies in Spanish sample compared to English sample. Also it was found that there was no significant difference in the identification of percentage of disfluencies in any of the languages suggesting that familiarity with Spanish made no significant difference when judging disfluencies in Spanish suggesting that language familiarity doesn't play a major role in the assessment of stuttering accurately

Contradicting the findings of Humphrey (2004), Van Borsel and Britto, Pereira (2005) found that language familiarity does influence stuttering assessment to some extent. They had 14 native speakers of Brazilian Portuguese and 14 native speakers of Dutch, all of whom were undergraduate students of Speech Language Pathology. The Brazilian Portuguese clinicians were asked to analyze stuttering samples of Dutch and Portuguese. Dutch clinicians were asked to analyze samples of Portuguese and Dutch. Both Dutch and Portuguese panel made more errors, were less confident and felt difficulty in identification of stuttering in unfamiliar language than in the native languages. When they were asked to provide characteristics of stuttering which helped them to analyse stuttering samples, the clinicians were able to provide more information in the native language compared to unfamiliar languages. These authors also suggested that the results might have been better if the languages were less remote to each other suggesting the identification and interpretation of stuttering is much easier if the unfamiliar languages are closer or similar to the native language of clinician.

Einarsdóttir and Ingham (2009) looked into the influence of language on the accuracy of judgement of stuttering in Icelandic children by ten Icelandic and ten experienced US

speech-language pathologist unfamiliar with the Icelandic language. The task was to judge 7 min audio visual samples of 3-5 years old children either stuttered or not stuttered. US SLPs were shown to be highly accurate in recognizing stuttering and nonstuttering exemplars from the sample. No significant differences were found between the SLPs of both the languages for the total number of intervals they judged as stuttered, the number of intervals judged as stuttered per child, or the number of agreed stuttered intervals. The findings suggest that judgments of occurrences of stuttering in CWS are not generally language dependent.

Lee, Robb, Ormond, and Blomgren, (2014) studied the role of language familiarity in bilingual stuttering assessment. This study was done to evaluate the ability of English-speaking speech-language pathologists (SLPs) to analyse stuttering behavior in two Spanish – English bilingual adult stutterer. The English-speaking SLPs were instructed to judge the frequency, severity, type, duration, and physical concomitants of stuttering in both languages of the two Adults with stuttering (AWS). The combined results from the English-speaking SLPs were later compared to the assessment of three Spanish–English bilingual SLPs. The participants in this study were a group of 19 English-speaking SLPs. The SLPs ranged in professional experience from 1 to 22 years, with a mean of 4.6 years. None of the SLPs were regularly exposed to Spanish, and none reported proficiency in any languages pertaining to the same branch of the Indo-European language tree as Spanish (i.e. the Romania branch), such as Portuguese, French, or Italian (Lewis, Simons, & Fennig, 2013). Results suggest that English-speaking SLPs (1) judged stuttering frequency to be greater in Spanish than English for AWS1, and equal in Spanish and English for AWS2, (2) were having high accuracy of evaluating individual moments of stuttering for the English samples compared to the Spanish samples, (3) identified fewer severe stuttering behaviours than the bilingual SLPs in both languages, and (4) were able to do accurate judgement of overall stuttering severity in both languages. The appropriate identification and description of individual moments of stuttering were less

accurate and less reliable among the English-speaking SLPs. English speaking SLPs were able to judge accurately in English compared to Spanish in both location and type of stuttering indicating the presence of a language familiarity effect for identification of finer characteristics of stuttering.

Hoffman et al. (2014) investigated the reliability of severity rating scale in an unfamiliar language. Twenty-six Australian speech-language pathologists rated ten stuttered samples of Australian English, and 10 stuttered speech samples of Mandarin using 9 point rating scale. Judges showed poor inter-agreement when using the scale to measure stuttering in Mandarin samples. Results also indicated that 50% of individual judges were unable to reliably measure the severity of stuttering in Australian English due to lack of experience and rating skills which directly suggest that along with language familiarity there is requirement of experience in analysing stuttering

Van Borsel and Pereira (2005) studied assessment of stuttering in a familiar versus an unfamiliar language. Fourteen native speakers of Brazilian Portuguese had to identify and judge stuttering in Dutch and Portuguese speakers, and fourteen native speakers of Dutch had to identify and judge stuttering in Brazilian Portuguese and Dutch speakers. The sessions were video recorded, and the judges were asked to classify the participants into stutterers and non-stutterers. 100% of identification of stutterers was not possible in both the language by the judges of both the panels. The result showed that the judges could do almost equal judgement in both native and foreign languages. However, the Dutch judges performed significantly better in identifying native stutterers than foreign stutterers compared to Portuguese judges. Both the panels could identify non-stutterers in native and non-native languages equally. It was also found that judges from both the panels were less confident in identifying stutters in the foreign language. Judges were also able to characterize the stuttering behaviors well in native than in non-native language.

2.4.2 Closeness of the language to the speaker

Another factor that can influence accuracy of stuttering diagnosis in a foreign language is closeness of the language to be judged to the mother tongue. Languages that have come from a common origin can be clubbed together (Huffman, 2015). These genetically-related languages can be closely or more distantly related, depending on how directly they trace back to a common source (Kemmer, 2013).

Van Borsel, Leahy, and Pereira (2008) probing on the findings of Van Borsel and Pereira (2005) suggested that closeness of language to the listener's native language is a determining factor when identifying stuttering in an unfamiliar language. In this study three panels of different linguistic background were asked to make judgements of stuttering in a sample of Dutch speakers. The panel consisted of 14 undergraduate students in speech-language pathology at an Irish University, they were all native speakers of English and none of them had ever studied or knew Dutch. The panel judged randomized video recordings of 10 Dutch speaking individuals, five of whom had been diagnosed to have stuttering, and five who were people who did not stutter (PWNS). At the end of the presentation of the entire set of samples, the raters were asked for an overall score of difficulty of the session, using a 100mm visual analogue scale with "very easy" and "very difficult" as left and right extremes respectively.

Results suggested that closeness to the native language is an influencing factor in judgements of stuttering in an unfamiliar language, as native speakers of English performed better in making fluency judgements of Dutch speakers than native speakers of Brazilian Portuguese. Results further suggested that the English panel had significantly more correct

identifications than the Brazilian Portuguese panel in identifying persons with no stuttering whilst there was no significant difference between the English and the Brazilian Portuguese panel in the identification of PWS. In other words, when the native language is more remote from the unfamiliar language there would be a higher risk for false positive identification.

2.4.3 Experience of the clinician

Finn and Cordes (1997) stressed that untrained, inexperienced interpreters may not provide useful or accurate information about stuttered speech.

Cordes and Ingham (1995), studied the inter-judge and intra-judge reliability of researchers and clinic directors they labeled “authorities” on stuttering. These 10 judges were chosen because of their academic and/or professional specialties in stuttering, based primarily on their record of peer-reviewed publications relevant to the identification of stuttered speech. Each authoritative judge was asked to make binary judgments of the presence or absence of stuttering in 5-min speech samples. Results showed that the experts had high levels of intra judge agreement (83.2–98.3%) and inter-judge agreement (84.0–85.6%).

Under identification of stuttering by students and clinicians could be a result of many factors. One possibility is that the under-identification is due to the judges’ lack of familiarity with the speakers’ individual speech or stuttering patterns; perhaps judges who had more time to familiarize themselves with the speakers or with the speech samples would identify more stuttering.

It is well documented that some judges have problems assessing stuttering accurately in their native language (Cordes & Ingham, 1994), and that experience and training may influence the accuracy of stuttering judgements in one’s native language (Cordes & Ingham, 1999; Cordes, Ingham, Frank, & Ingham, 1992). It can be hypothesised that clinicians with

many years of experience who have seen many clients and hence are better at analyzing stuttering in their native language may also be better at assessing stuttering in a foreign language.

2.4.4 Severity

Stuttering severity is a factor likely to be important too. According to Watson and Kayser (1994), assessing stuttering in a foreign language may not be so difficult when the client is a person who stutters severely. In such cases, there is often excessive tension and secondary behaviors that are easily recognized, even if one is not familiar with the language. Assessing stuttering that is mild or moderate and is not accompanied by conspicuous tension or secondary behaviors. Diagnosing stuttering severity accurately in such condition is much more difficult in foreign language. Even the study carried by Cosyns, Einarsdóttir, and Borsel (2015) revealed that language closeness has an impact on the accuracy of rating stuttering severity. Stuttering severity ratings were more in line with those of the native experienced speakers in analysing severe stuttering, and this was irrespective of the experience of the rater. When stuttering severity was mild to moderate, the following pattern emerged: The closer the language to the mother tongue, the more accurate an experienced rater was.

Need for the study

There have been numerous studies carried out with respect to clinician's familiarity of language in diagnosing stuttering in Western population. India being linguistically and culturally diverse country where different languages have originated from ancestral tongue, language similarity would be more prominent. So it is required to determine whether stuttering judgment accuracy is influenced by clinician's familiarity with the speaker's language or the

assessment of stuttering remains universal across all languages. This warrants the need for assessing stuttering judgements across languages in the Indian scenario.

Aim of the study

The present study aims to explore the possible role and interplay of factors involved in the identification of stuttering severity in an unfamiliar language in the Indian context.

Objectives of the study

1. Assessment of stuttering samples by SLPs in unfamiliar language (comparison between Aryan vs Dravidian languages).
2. Assessment of stuttering samples by SLPs in a language that is close to his/her native language (within Dravidian languages).
3. Assessment of stuttering samples of varying severity by SLPs in unfamiliar and familiar languages.
4. Assessment of stuttering samples in an unfamiliar language by experienced and inexperienced SLPs.

Chapter 3

Method

3.1 Participants

This study consisted of two groups of participants. Group 1 consisted of speech-language pathologists (SLP) and Group 2 consisted of adults with stuttering (AWS).

3.1.1 Group1: Speech Language Pathologists (SLPs)

Participants of this group constituted of five Speech Language Pathologist who were proficient in Kannada (SLP1K), Malayalam (SLP2M) and Hindi (SLP3H, CL1H and SLP5H).

SLP1K, SLP2M and SLP3H had theoretical and clinical experience in the assessment and management of stuttering for a minimum of 4 years, whereas CL1H and SLP5H had 1 year and 5 years of experience respectively. All the SLPs had no formal proficiency in each other's language. LEAP –Q protocol was used to establish language proficiency of SLPs in their mother tongue.

3.1.2 Persons with Stuttering

Different speech samples were collected from 30 adults with stuttering, comprising of 10 Kannada, 10 Malayalam, 5 Telugu and 5 Tamil speakers (severity ranging from very mild to very severe level). AWS were also administered LEAP-Q to check proficiency in their native language. A written consent from the participants was taken prior to their inclusion in the study.

3.2 Procedure

3.2.1 Speech sample collection

Speech samples of adults with stuttering were video recorded in a quiet recording room using a digital camcorder. Both reading and job task were recorded separately. Respective reading materials were provided for the different languages (Kannada, Malayalam, Tamil and Telugu).

A suitable topic was provided for job task and 5 min of speaking time was recorded from each speaker (AWS). The entire reading passage was recorded for reading task.

3.2.2 Speech sample analyses

Speech samples were analysed using Stuttering Severity Instrument for Children and Adults-4th Edition (SSI-4; Riley, 2009). The data was analysed as per the Stuttering Judgement Form (SJF) given along with SSI-4. The SJF is designed to facilitate consistent notation of stuttering severity and characteristics across SLPs. This is to enable SLPs to make their stuttering judgements in a manner that is realistic and applicable to the clinical setting. SJF includes type, frequency of stuttering, moment of stuttering, duration, physical concomitants and speech naturalness and overall severity. SLPs were provided with the speech samples collected by the first author, along with the reading passage transcripts in IPA (International Phonetic Alphabet). They were then asked to transcribe each speech sample in the IPA format. The SLPs were given the following tasks.

A) Language familiarity

A 5-point rating scale was used to check for familiarity of SLPs in assessing samples of a particular language

0: Cannot understand language

1: Can identify the name of the language

2: Can identify some words in the language

3: Can identify content partially

4: Can completely understand the language

B) Analyses of Stuttering using SSI4- SLPs were given instructions to compute the following:

a) Frequency

“Circle each syllable, word or phrase on the transcript where you observed a moment of stuttering and indicate the stutter type using the abbreviations provided. The type categories available are Repetition (“Rep”), prolongation (“Pr”), blocks (“Bl”), broken words (“Br”).

“Calculate the percent dysfluency using the formula”

Number of words stuttered /no of words uttered *(100)

b) Duration

Using digital stopwatch, measure the duration of the stuttering moment, identified to be longest in duration”.

c) Physical Concomitants

“Rate the physical concomitants of stuttering observed within the same sample in the areas of distracting sounds, facial grimace, head movement and movements of the extremities”.

d) Severity

“Rate the overall severity of stuttering within the sample (combined scores of frequency, duration and physical concomitants)”.

e) Rate of Speech

“Compute rate of speech in terms of syllable per second”

f) Speech Naturalness

“Rate speech naturalness using 9-point rating scale”

C) Ease of rating stuttering severity- SLPs were given the following 5-point rating scale

0: Very easy to analyze

1: Somewhat easy

2: Somewhat difficult

3: Very difficult

4: Cannot analyze at all

All speech samples were collected by the first author. During the analyses SLPs were seated in front of a system, and provided with headphones, a digital stopwatch, and a copy of the SJF along with the transcribed reading material. Prior to beginning the task, SLPs were oriented about the video clips and completion of the SJF as well as any necessary explanation of the abbreviations and terms used within the SJF.

The SLPs were asked to view each sample as many times as necessary to make the required judgements. SLPs recorded their judgements of stuttering severity and characteristics using the corresponding transcript and judgement pages of the SJF. At the end of the session, the SJFs were checked to ensure completion as per the instructions, and collected for data analysis.

Chapter 4

Results

The data was analyzed in two phases,

Phase 1: Analysis of Stuttering severity, Speech naturalness and Rate of speech by 5
Speech language pathologists.

Phase 2: Statistical analyses

Phase 1 – Raw data

The following tables shows the raw data acquired from different clinician of stuttering severity assessments in different languages, using the Judgement Record Form

1.Stuttering severity

1.1 Kannada stuttering samples

The table 4.1 shows analysis of 10 Kannada samples by SLP1K (Kannada native speaker with 4 years experience), SLP2M (Malayalam native speaker with 4 years experience), SLP3H (Hindi native speaker with 4years experience), CL1H (Hindi native speaker with 1 year experience) and SLP5H (Hindi native speaker with minimum 5years experience)

The analyses obtained were compared with the severity rating computed by 2 experienced speech-language pathologists (min 5 years experience) whose native language was Kannada. This was considered as the reference for comparison.

Table 4.1*Stuttering severity of Kannada speech samples*

Samples	Severity reference	SLP 1K	SLP 2M	SLP 3H	CL1H	SLP 5H
1	Very Mild	Very Mild	Mild	Mild	Mild	Very Mild
2	Mild	Mild	Moderate	Very Mild	Mild	Mild
3	Moderate	Moderate	Moderate	Severe	Moderate	Moderate
4	Mild	Mild	Very Severe	Moderate	Moderate	Mild
5	Very Severe	Very Severe	Very Severe	Very Severe	Very Severe	Very Severe
6	Very Mild	Very Mild	Severe	Moderate	Mild	Very Mild
7	Severe	Severe	Severe	Severe	Severe	Severe
8	Moderate	Moderate	Severe	Very Mild	Mild	Moderate
9	Moderate	Moderate	Mild	Mild	Very Mild	Moderate
10	Mild	Mild	Moderate	Very Mild	Very Mild	Mild

1.2 Malayalam stuttering samples

10 Malayalam speech samples of persons with stuttering were analyzed by a native Kannada speaker (SLP1K). The severity reference was computed based on assessment done by 2 native Malayalam speech-language pathologists. Findings are as shown in table 4.2

Table 4.2*Stuttering Severity of Malayalam samples*

Samples	Severity reference	SLP 1K
1	Moderate	Mild
2	Moderate	Moderate

3	Very Severe	Very Severe
4	Mild	Mild
5	Severe	Severe
6	Mild	Mild
7	Very Mild	Very Mild
8	Severe	Severe
9	Very Mild	Mild
10	Very Severe	Very Severe

1.3 Telugu stuttering samples

5 Telugu speech samples of persons with stuttering were analyzed by a native Kannada speaker (SLP1K). The severity norms were computed based on assessment done by 2 native Telugu speech-language pathologists. Findings are as shown in table 4.3

Table 4.3

Stuttering severity of Telugu samples

Samples	Severity reference	SLP1K
1	Very Mild	Very Mild
2	Mild	Moderate
3	Moderate	Moderate
4	Severe	Severe
5	Very Severe	Very Severe

1.4 Tamil stuttering samples

5 Tamil speech samples of person with stuttering were analyzed by a native Malayalam speaker (SLP2M). The severity norms reference was computed based on the assessment done by 2 native Tamil speech-language pathologists. Findings are as shown in table 4.4

Table 4.4*Stuttering severity of Tamil samples*

Sample	Severity norm	SLP 2M
1	Mild	Mild
2	Mild	Mild
3	Moderate	Moderate
4	Severe	Severe
5	Mild	Moderate

2. Rate of speech

SLPs of various native languages, analysed rate of speech in the stuttering samples of different languages to see the effect of language familiarity. This was analysed using perceptual judgement of the clinician.

2.1 Kannada stuttering samples

10 Kannada speech samples were analysed for rate of speech by 2 native Kannada speakers for computing the reference. The analyses by the 5 different SLPs (SLP1K, SLP2M, SLP3H, CL1H and SLP5H) were compared with the reference. The results are as shown in 4.5

Table 4.5*Rate of speech of Kannada speech samples*

Samples	Reference	SLP1K	SLP2M	SLP3H	CL1H	SLP5H
1	Average	Average	Fast	Average	Average	Average
2	Slow	Slow	Average	Slow	Average	Slow
3	Average	Average	Fast	Slow	Average	Average
4	Average	Average	Average	Average	Average	Average

5	Slow	Slow	Slow	Slow	Slow	Slow
6	Fast	Fast	Average	Average	Fast	Fast
7	Fast	Fast	Average	Slow	Average	Fast
8	Average	Average	Average	Average	Average	Average
9	Average	Average	Slow	Slow	Average	Average
10	Average	Average	Average	Fast	Average	Average

2.2 Malayalam stuttering samples

10 Malayalam speech samples were analysed for rate of speech by 2 native Malayalam speakers for computing the reference. The analysis by Kannada native speaker (SLP1K) was compared with the reference. The results are as shown in table 4.6

Table 4.6

Rate of speech of Malayalam speech samples

Samples	Reference	SLP1K
1	Average	Average
2	Average	Average
3	Fast	Fast
4	Average	Average
5	Fast	Fast
6	Average	Average
7	Slow	Average
8	Slow	Slow
9	Slow	Slow
10	Fast	Fast

2.3 Telugu stuttering samples

5 Telugu speech samples were analysed for rate of speech by 2 native Telugu speakers for computing the reference. The analysis by Kannada native speaker (SLP1K) was compared with the reference. The results are as shown in 4.7

Table 4.7

Rate of speech of Telugu samples

Samples	Reference	SLP1K
1	Average	Average
2	Fast	Fast
3	Average	Average
4	Average	Average
5	Slow	Slow

2.4 Tamil stuttering samples

5 Tamil speech samples were analysed for rate of speech by 2 native Tamil speakers for computing the reference. The analysis by Malayalam native speaker (SLP2M) was compared with the reference. The results are as shown in 4.8

Table 4.8

Rate of speech of Tamil samples

Samples	Reference	SLP2M
1	Average	Average
2	Fast	Fast
3	Average	Average
4	Average	Average
5	Average	Average

3.Speech naturalness

To check for speech naturalness, SLPs analyzed the speech samples of persons with stuttering speaking different native languages on a 9-point rating scale where 1 referred to highly natural and 9 was least natural. The findings are as shown in the tables

3.1 Kannada

10 Kannada speech samples were analysed for speech naturalness by 2 native Kannada SLPs for computing the reference. the analyses by the 5 different SLPs (SLP1K, SLP2M, SLP3H, CL1H and SLP5H) were compared with the reference. The results are as shown in table 4.9

Table 4.9

Speech Naturalness of Kannada samples

Samples	Reference	SLP1K	SLP2M	SLP3H	CL1H	SLP5H
1	3	3	3	3	3	3
2	5	5	6	7	3	5
3	6	6	7	5	2	6
4	3	4	8	4	3	4
5	7	8	8	8	6	8
6	2	3	6	4	2	3
7	2	2	6	8	2	2
8	5	6	7	3	3	6
9	3	3	6	3	2	3
10	5	5	6	3	3	5

3.2 Malayalam

10 Malayalam speech samples were analysed for rate of speech by 2 native Malayalam SLPS for computing the reference. The analysis by Kannada native speaker (SLP1K) was compared with the reference. The results are as shown in 4.10

Table 4.10

Speech Naturalness of Malayalam samples

Samples	Reference	SLP1K
1	4	4
2	6	2
3	6	7
4	4	1
5	7	8
6	3	6
7	3	1
8	5	9
9	3	5
10	6	8

3.3 Telugu

5 Telugu speech samples were analysed for rate of speech by 2 native Telugu SLPS for computing the reference. the analysis by Kannada native speaker (SLP1) was compared with the reference. The results are as shown in table 4.11

Table 4.11*Naturalness of Telugu samples*

Samples	Reference	SLP1K
1	3	2
2	5	6
3	5	6
4	6	5
5	6	6

3.4 Tamil

5 Tamil speech samples were analysed for rate of speech by 2 native Tamil SLPS for computing the reference. The analysis by Malayalam native speaker (SLP2) was compared with the reference. The results are as shown in table 4.12

Table 4.12*Speech Naturalness of Tamil samples*

Sl no	Reference	SLP2M
1	2	3
2	3	3
3	5	7
4	4	6
5	5	6

Phase 2: Statistical analyses

The data from phase 1 in the different language samples that is Kannada(N=10), Malayalam(N=10), Telugu(N=5) and Tamil(N=5) was statistically analysed for the following investigations.

Investigation 1: 10 Kannada speech samples were analyzed by SLP1K, SLP2M and SLP3H. This investigation was done to compare the assessment of stuttering by SLP s in familiar and unfamiliar languages. (Aryan vs Dravidian languages)

Investigation 2: SLP1K was included for the analysis of 10 Malayalam samples. This was done in order to check for the proficiency of the SLP in assessing stuttering samples belonging to the same language class (within Dravidian languages) which are genetically non related.

Investigation 3: SLP1K and SLP2M were included for analysis of the samples from similar language classes which are genetically related languages. Here SLP1K analyzed 5 Telugu samples and SLP2M analyzed 5 Tamil samples.

Investigation 4: This investigation included two native Hindi speakers Clinician CL1H (with 1year experience in assessing clients with stuttering) and SLP5H (with at least 5 years of experience in the same area) who analyzed 10 Kannada samples individually.

The collected raw data was subjected to Shapiro Wilk's test for normality. The results revealed that the data obtained was not normally distributed. Hence, non-parametric tests were carried out for the analyses.

Investigation 1

Friedman's test was performed to see the significant difference between SLP1K, SLP2M and SLP3H in analyzing Kannada language samples using the three parameters namely, frequency, duration and physical concomitants. The test indicated that there was a significant difference between SLP1K, SLP2M and SLP3H in marking the frequency of stuttering in Kannada language (N=10, fr=9.214, p<0.05).

Significant difference was also seen between different Speech Language Pathologists in marking physical concomitants score for Kannada stuttering samples (N=10 fr=9.587, p<0.05). However, there was no significant difference found in marking duration for the stuttering samples between each SLP when compared to the reference value (N=10 fr =3.532, p>0.05).

Since there was significant difference between clinicians in the domain of frequency and physical concomitant the data pertaining to these were subjected to Wilcoxon signed rank test to check pairwise significant difference. The test stated that there was significant difference between SLP1K –SLP2M for frequency (z=-2.508, p<0.05) and physical concomitants (z=2.655, p<0.05), SLP1K-SLP3H for frequency (z=-.423, p<0.05) and physical concomitants (z=-.154, p,0.05) and SLP2M-SLP3H for frequency (z=-2.322, p<0.05) and physical concomitants (z=-1.602, p<0.05).

The table 4.13 shows the depiction of stuttering severity by different SLPs (SLP1K, SLP2M and SLP3H) in comparison to the reference and the percentage of correct diagnosis marked in each severity category.

The results of cross tabulation are given in table 4.13

Stuttering severity computed in phase 1 was given the following values: 1=very mild (vm), 2=mild (m), 3=moderate (md), 4=severe(s) and 5=very severe(vs)

Table 4.13*Cross tabulation of reference severity and clinician severity rating of Kannada samples*

Reference	No of samples	SLP1K					SLP2M					SLP3H				
		1(vm)	2(m)	3(md)	4(s)	5(vs)	1(vm)	2(m)	3(md)	4(s)	5(vs)	1(vm)	2(m)	3(md)	4(s)	5(vs)
1(vm)	Count	2	2	0	0	0	0	1	0	1	0	0	1	1	0	0
	%		100				0%				0%					
	Correct		%													
2(m)	Count	3	0	3	0	0	0	0	2	0	1	2	0	1	0	0
	%			100					0%					0%		
	correct			%												
3(md)	Count	3	0	0	3	0	0	1	1	1	0	1	1	0	1	0
	%				100				33.33					0%		
	correct				%				%							
4(s)	count	1	0	0	0	1	0	0	0	1	0	0	0	0	1	0
	%					100				100					100	
	correct					%				%					%	
5(vs)	count	1	0	0	0	0	1	0	0	0	1	0	0	0	0	1
	%						100				100					100
	correct						%				%					%
Correctly diagnosed	T=10		2	3	3	1	1		1	1	1			1	1	

The accuracy of diagnosis by SLP1K was 100% for all the given samples.

The accuracy of diagnosis by SLP2M was 33.3% for mild, 100% for severe and very severe stuttering.

SLP3H had accuracy of 100% only for diagnosis of severe and very severe stuttering samples.

The comparison of stuttering severity computed by the three SLPs with the reference is graphically shown in Fig 1 and the accuracy of diagnosis is shown in Fig 2.

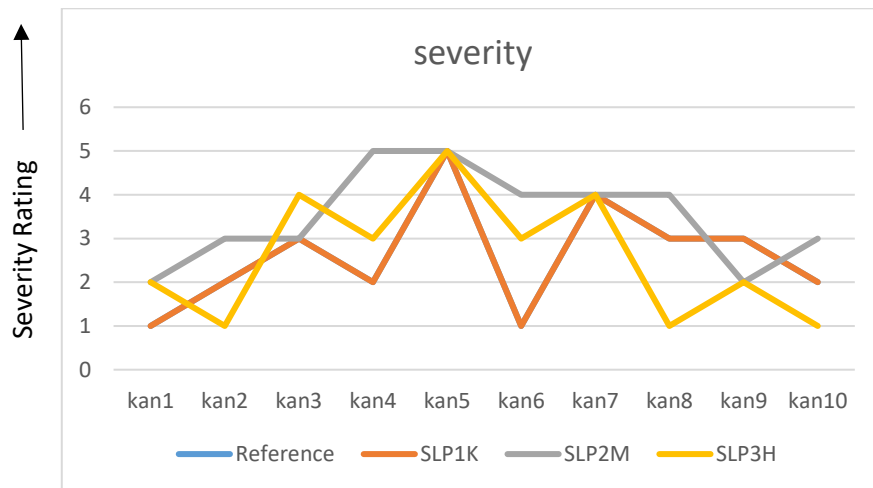


Fig 4.1: SLPs diagnosis of stuttering severity of Kannada samples in comparison to the reference.

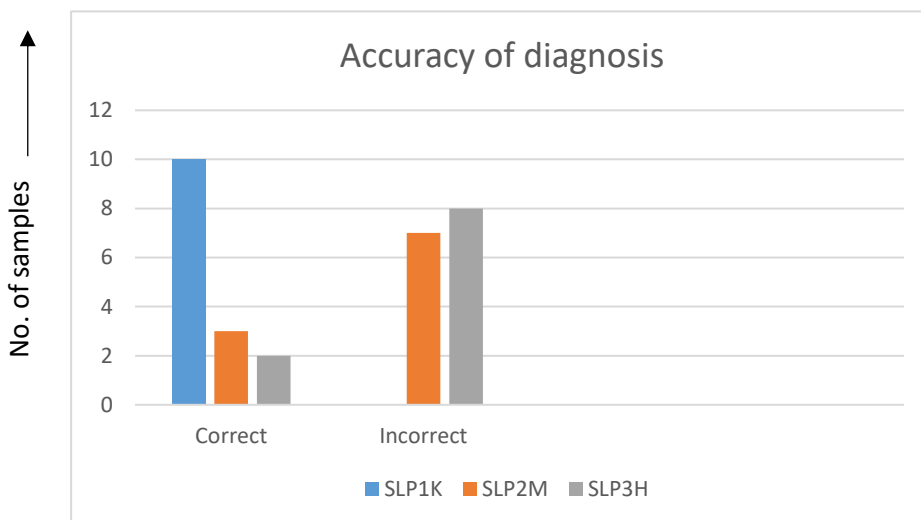


Fig 4.2: Number of Kannada samples correctly diagnosed by SLPs

SLP1K correctly diagnosed all the 10 Kannada samples out of which 2 were very mild, 3 Mild, 3 moderate, 1 severe and 1 very severe

SLP2M diagnosed 3 samples correctly out of which 1 was mild, 1 severe and 1 very severe and SLP3H diagnosed only 2 samples correctly of which 1 severe and 1 very severe as depicted in the Fig 4.1

Investigation2

Friedman's test indicated no significant difference between the diagnoses of SLP1K with the reference in analyzing Malayalam speech samples in the various domains that is frequency (N=10, fr=3.6, p>0.05), duration (N=10, fr=4.750 P>0.05) and physical concomitant (N=10, fr=.483, P>0.05)

The following table shows the depiction of stuttering severity by SLP1K in comparison to the reference and also percentage of correct diagnosis marked in each severity category

Table 4.14:

Cross tabulation of reference severity and clinician severity rating of Malayalam samples

Reference		No. of samples	SLP1K				
			1(vm)	2(m)	3(md)	4(s)	5(vs)
1(vm)	Count	2	2	0	0	0	0
	% correct		100%				
2(m)	Count	2	0	1	1	0	0
	% correct			33.33%			
3(md)	Count	2	0	1	1	0	0
	% correct				50%		
4(s)	Count	2	0	0	0	2	0
	% correct					100%	

5(vs)	count	2	0	0	0	0	2
	%						100%
	correct						
Correctly diagnosed	T=10	1			1	1	1

The accuracy of diagnosis by SLP1K was 100% for very mild, 33.33% for mild, 50% for mild and 100% for both severe and very severe stuttering.

The comparison of stuttering severity computed by SLP1K with the reference is graphically shown in Fig 4.3 and the accuracy of diagnosis is shown in Fig 4.4

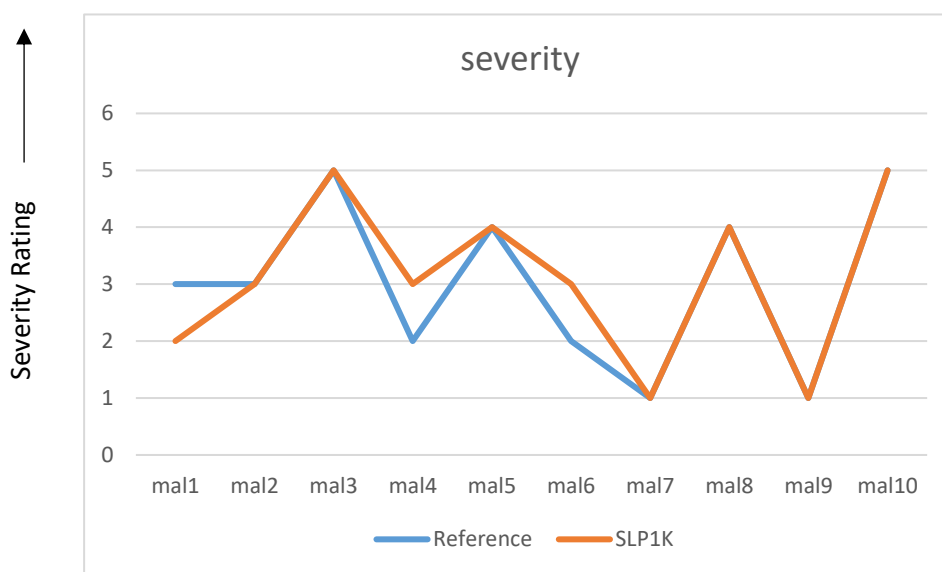


Fig 4.3: SLP1K diagnosing stuttering severity in Malayalam samples in comparison to the reference

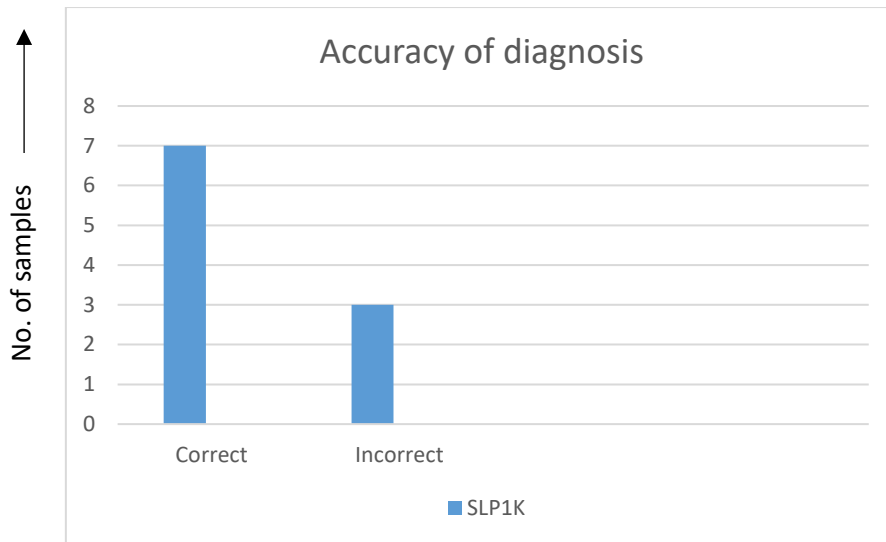


Fig 4.4: Number of Malayalam samples correctly diagnosed by SLP1K

SLP1K correctly diagnosed 7 out of 10 samples out of which 2 were very mild, 1 mild, 1 moderate, 2 each in severe and very severe categories.

Investigation 3

Comparisons were made between the genetically related language pairs i.e., Kannada-Telugu and Malayalam-Tamil

- (i) Analysis of Telugu speech samples

Chi square test revealed no significant difference between SLP1 analyzing Telugu samples and the depicted reference ($X^2(5) = 15, p > 0.05$)

The table 4.15 shows the depiction of stuttering severity by different SLP1K in comparison to the reference and also percentage of correct diagnosis marked in each severity category

Table 4.15*Cross tabulation of reference severity and clinician severity rating of Telugu samples*

Reference		No. of samples	SLP1K				
			2	3	4	5	
1	count	1	1	0	0	0	0
	% correct		100%				
2	count	1	0	0	1	0	0
	% correct		0%				
3	count	1	0	0	1		0
	% correct		100%				
4	count	1	0	0	0	1	0
	% correct		100%				
5	count	1	0	0	0	0	1
	% correct		100%				
Correctly diagnosed		T=5	1		1	1	1

The accuracy of diagnosis by SLP1K 100% for Very Mild,0% for Mild,100% for Moderate and 100% for both Severe and Very Severe speech samples

The comparison of stuttering severity computed by SLP1K with the reference (Telugu) is graphically shown in Fig 4. 5 and the accuracy of diagnosis is shown in Fig 4.7.

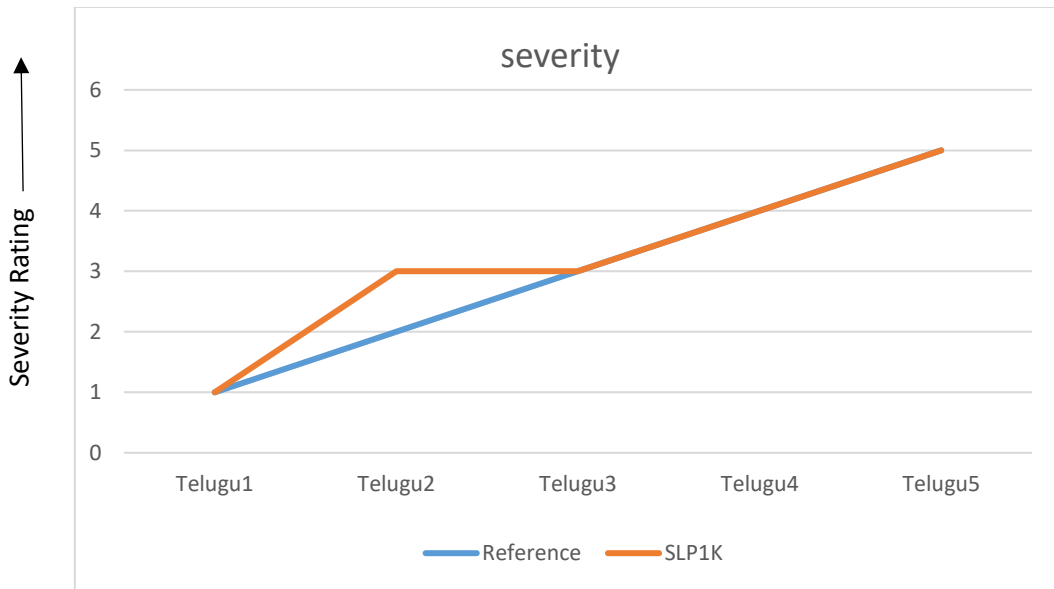


Fig 4.5: SLP1K diagnosing stuttering severity of Telugu samples in comparison to reference

SLP1K correctly diagnosed 4 out of 5 samples (Telugu) out of which 1 was very mild,1 moderate,1 each in severe and very severe categories as shown in Fig 4.7

(ii) Analysis of Tamil samples

Chi square test revealed no significant difference between SLP2M analyzing Tamil samples and the depicted reference ($X^2=6.67, p>0.05$)

The table 4.16 shows the depiction of stuttering severity by SLP2M in comparison to the reference and also the percentage of correct diagnosis marked in each categories

Table 4.16*Cross tabulation of reference severity and clinician severity rating of Tamil samples*

Reference		No of samples	SLP2M				
			1(vm)	2(m)	3(md)	4(s)	5(vs)
1(vm)	count	0	0	0	0	0	0
	% correct	0%					
2(m)	count	3	0	2	1	0	0
	% correct	66.66%					
3(md)	count	1	0	0	1	0	0
	% correct	100%					
4(s)	count	1	0	0	0	1	0
	% correct	100%					
5(vs)	count	0	0	0	0	0	0
	% correct	0					
Correctly diagnosed			1	1	1		

The accuracy of diagnosis by SLP2M was 0% for Very Mild, 66.66% for Mild, 100% for Moderate and 100% for Severe stuttering categories.

The comparison of stuttering severity computed by SLP2M with the reference (Tamil) is graphically shown in Fig 4.6 and the accuracy of diagnosis is shown in Fig 4.7.

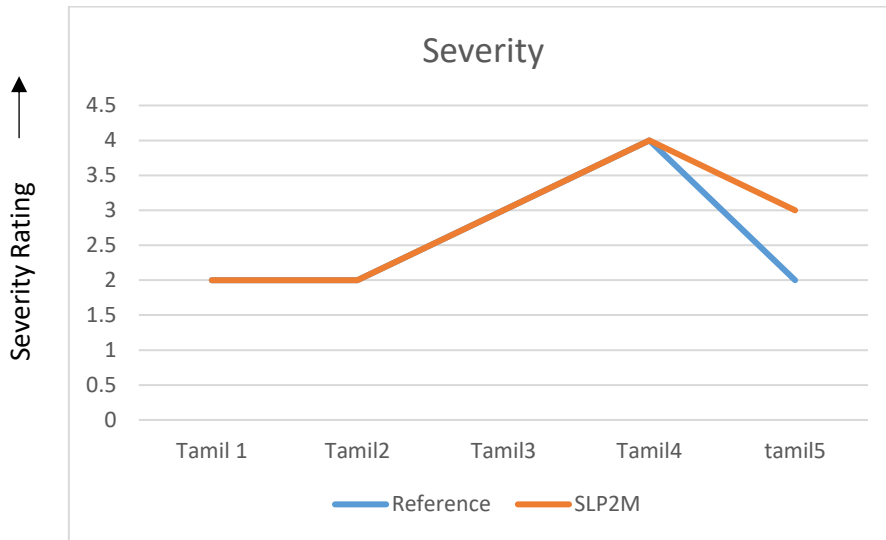


Fig 4. 6: SLP2M diagnosing stuttering severity of Tamil samples in comparison to the reference

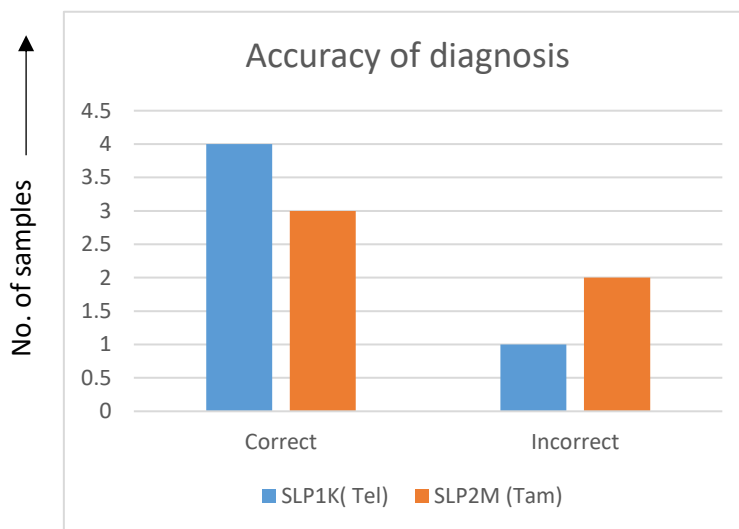


Fig 4.7: The number of Telugu and Tamil samples correctly diagnosed by SLP1K and SLP2M respectively.

SLP2M has correctly diagnosed 4 out of 5 Tamil samples out of which 2 were mild, 1 moderate and 1 severe as depicted in Fig 4.7.

Investigation 4

Chi square test carried out to see the significant difference between two Hindi speakers: 1 clinician in Speech language pathology (CL1H) and SLP5H in analyzing 10 Kannada samples, to check for the influence of experience in correctly diagnosing stuttering. The test indicated significant difference in analysis of stuttering between the two Hindi speakers of varying experience ($X^2=33.33$, $p<0.05$).

The table 4.17 shows computation of stuttering severity by the two Hindi speakers CL1H and SLP5H in comparison with the reference.

Table 4.17

Cross tabulation of reference severity and clinician (CL1H and SLP5H) severity rating of for Kannada samples

Reference	No of samp les	CL1H					SLP5H					
		1	2	3	4	5	1	2	3	4	5	
1	Count	2	0	2	0	0	0	2	0	0	0	0
	% correct	0	%					100%				
2	count	3	1	1	1	0	0	3		0	0	
	% correct			33.33	%			100	%			
3	count	3	1	1	1	0	0		3	0	0	

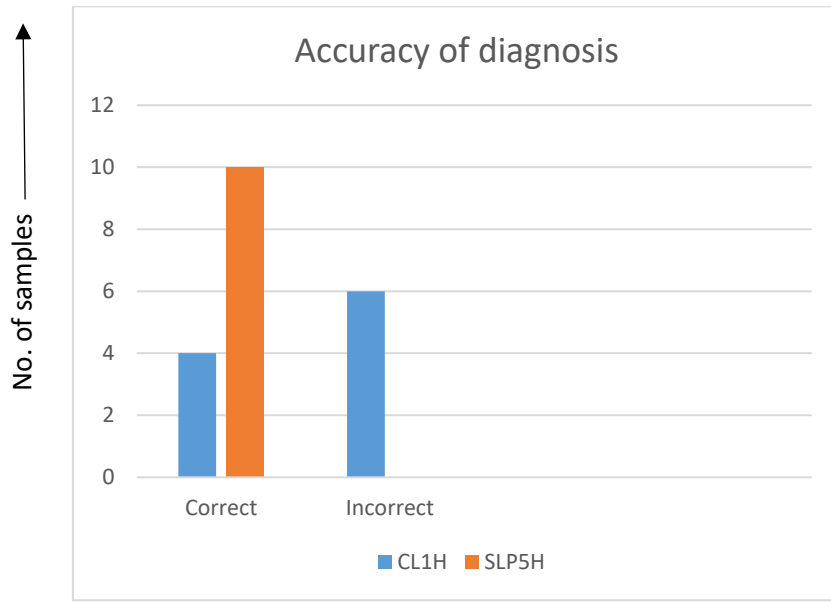


Fig 4.9: The number of Kannada samples correctly diagnosed by CL1H and SLP5H

CL1H correctly diagnosed 4 out of 10 samples out of which 1 was mild, 1 moderate, 1 severe and 1 very severe as depicted in Fig 4.9.

Along with all these investigation other parameters like speech naturalness, rate of speech and ease of rating was also analyzed. Speech naturalness, and ease of rating the samples were subjected to Friedman's test to compare between SLP1K, SLP2M and CL1H analyzing Kannada samples. The test revealed significant difference among different clinicians in rating speech naturalness ($\chi^2(10)=15.73, p<0.05$) and ease of rating ($\chi^2(10)=13.36, p<0.05$).

Chi square test was carried out to check for difference in assessment of Rate of speech between SLP1K, SLP2M and SLP3H. The test showed significant difference ($\chi^2(10)=20, p<0.05$) between the raters for computing the rate of speech.

Chapter 5

Discussion

The present study focuses on the effect of language familiarity of Speech Language pathologist in diagnosing stuttering. The findings of the present study are discussed as follows

I. Language familiarity

Language familiarity refers to the ease in understanding a particular language. Languages can belong to different language classes and may be genetically related or non-related. Genetically related languages can be closely or distantly related, depending upon how directly they trace back to common source (Kemmer, 2013). Stanford Steever (1998) described the Indian language family tree as follows

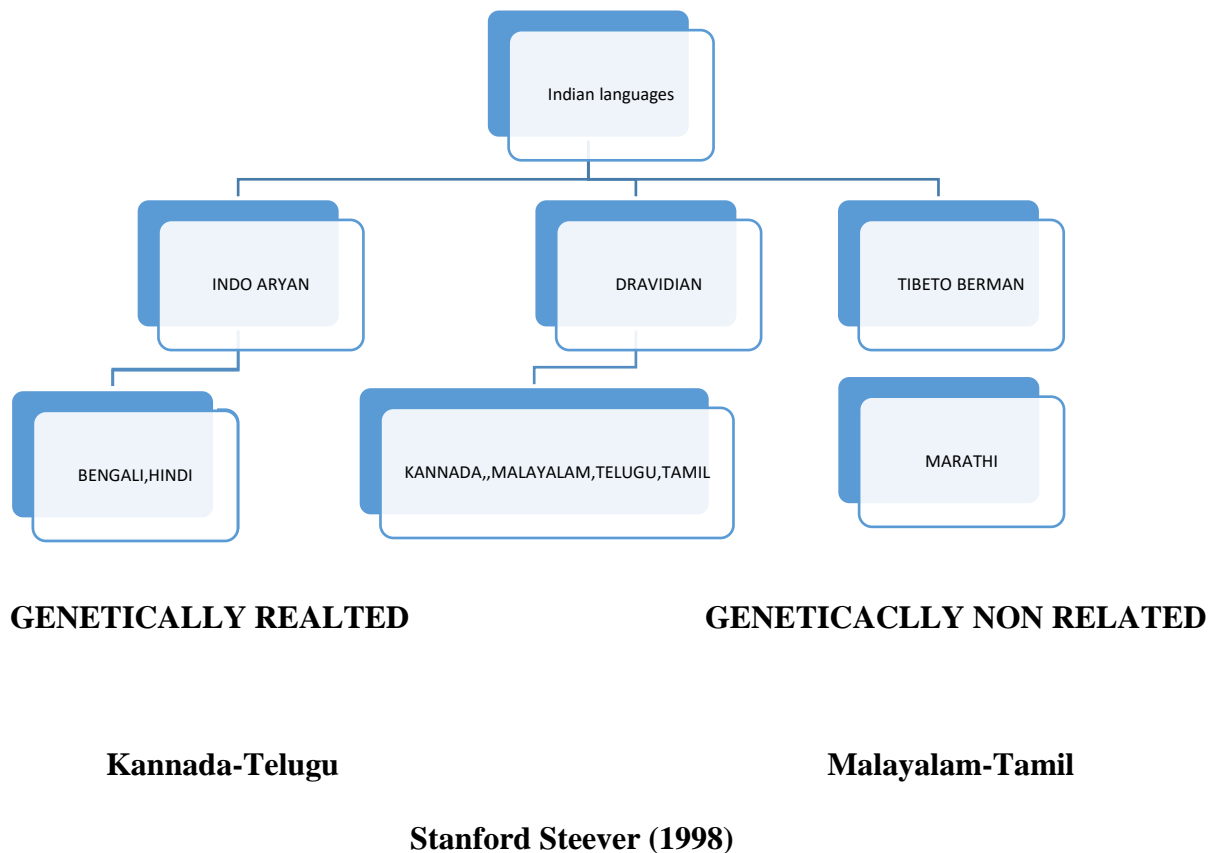


Fig 10: Language family tree in India

In the present study two Indian language families were taken- Indo Aryan and Dravidian. Hindi was the Indo Aryan language and Kannada, Malayalam, Telugu and Tamil were the Dravidian languages considered

Based on the results by Steever (1998) genetically related language pairs were Kannada –Telugu and Malayalam –Tamil and the genetically non related language pairs were Kannada-Malayalam and Telugu –Tamil

Influence of language familiarity was checked across language classes, within language class and across genetically related and non-related languages

1. Across language class

The results of the study (investigation 1) suggested great variation when Indo Aryan (Hindi speaker) analysed Dravidian language samples (Kannada) as the two languages come from different language families contributing to the two languages being remote. The Hindi speaker was able to accurately diagnose only 2 out of 10 samples. This remoteness resulted in decreased language familiarity, hence leading to poorer efficiency in diagnosing stuttering in languages belonging to different groups. This is supported by Cosyns, Einarsdóttir and Van Borsel (2015), who suggest that when the mother tongue is more remote from a foreign language, there is a higher risk for false positive identification. Amanda Lee, Robb, Ormond and Blomgren (2014) also found that there is presence of language familiarity effect for identification of the finer characteristics of stuttering.

However, Einarsdóttir and Ingham (2009) found that language doesn't play an important role in the assessment of stuttering in different language families which are unfamiliar to the speech language pathologist, contradicting the findings of the present study.

Also, in the present study no significant difference was found in marking duration of different events between each SLP, suggesting that duration could be considered as a robust parameter in stuttering judgements irrespective of language familiarity.

Judgment of frequency of stuttering however showed variation among SLPs indicating greater accuracy in estimating stuttering frequency when the language of the sample analysed is closer to the native language of the SLP

2. Genetically related and genetically non related languages

The within group analysis was done among the Dravidian languages that is Kannada-Telugu and Tamil- Malayalam which are genetically related languages. Kannada -Malayalam language comparison was done for non-genetically related languages This factor was seen to have a major effect in the analysis of stuttering. Although, literature in this area for Indian languages is very limited, there are supporting studies done in foreign languages. It is worth mentioning that there are no studies till date comparing language familiarity across Indian languages for estimation of accuracy in stuttering judgements. Borsel, Leahy and Pereira (2008) suggested that closeness to the native language is an influencing factor in judgements of stuttering in an unfamiliar language.

Analyses of Kannada samples by Malayalam speaker (SLP 2M) did not yield accurate diagnosis of stuttering as the two languages were not genetically related, thus making the two languages distant (investigation1). However, results from investigation 2 revealed more proficiency in analyzing Malayalam samples by native Kannada speaker (SLP 1K). This could be explained by the informal exposure of Kannada speaker to Malayalam language in his clinical setup. Also, the Kannada speaker's familiarity of Malayalam was more (3 on language familiarity scale) than the Malayalam speaker's familiarity of Kannada (1 on language familiarity scale). This indicates that remoteness from the clinician's native language can leads

to less accuracy in diagnosis of stuttering. This would however not hold good if the clinician has had prior exposure to a particular nonnative language in some or other way, for some duration.

However as found in investigation 3, analyses of Telugu samples by Kannada speaker (SLP 1K) and Tamil samples by Malayalam speaker (SLP 2M) revealed more accuracy as they are shown to be coming from same ancestral tongue. Closer the language of the speech sample to the native language of speech language pathologist, greater is the accuracy of diagnosis as closely related languages share some linguistic characteristics. This finding is supported by Van Borsel, Leahy and Pereira (2005) who found that closeness to the mother tongue is a determining factor when assessing stuttering in an unfamiliar language. When the native language is more remote from the unfamiliar language, there would be a higher risk for inaccurate diagnosis. Cosyns, Einarsdóttir and Borsel (2015) also stated that the closer the language to the mother tongue, the more accurate an experienced rater was.

II Experience of the clinician

An important analysis considered in the study was the impact of experience of clinician/SLP on the diagnosis of stuttering. A significant correlation was found between the years of experience of the SLP in stuttering assessment and his/her accuracy in diagnosing stuttering, irrespective of the language the clinician spoke. Regardless of the familiarity of the language of the speech samples to be assessed, there was significant effect of number of years of experience of the SLP. The SLP 5H in the present study was a native Hindi speaker and had a minimum of 5 years experience in stuttering assessment and management. He was able to accurately diagnose stuttering in all 10 Kannada samples. The findings are supported by Cordes and Ingham (1999); Cordes, Ingham, Frank, and Ingham (1992) who hypothesized that clinicians who have many years of experience and have seen many clients and hence are better at assessing stuttering in their native language may also be better at assessing stuttering in a

foreign language. Cordes and Ingham (1995) also showed that the experts had high levels of intra judge agreement (83.2–98.3%) and inter-judge agreement (84.0–85.6%) in stuttering assessment.

CL1H was a clinician with 1 year of experience in stuttering assessment. He was able to correctly diagnose, only 4 out of 10 samples in non-familiar language i.e. Kannada (rating of 0 on language familiarity scale). The findings are supported by Finn and Cordes (1997) who stressed that untrained, inexperienced interpreters may not provide useful or dependable information about stuttered speech.

III Severity of stuttering

The next aspect probed into was, the severity of stuttering in the samples analyzed. All clinicians were able to accurately analyse severe and very severe stuttering samples irrespective of language suggesting that, greater the severity of stuttering in the sample, more accurate was the diagnosis. The probable reason could be that more severe stuttering makes it easier for the clinician to pin point the dysfluent behaviors and the physical concomitant as these would be more pronounced in individuals having severe and very severe stuttering. Watson and Kayser (1994) opined that assessing stuttering in a foreign language may not be so difficult when the client is a person who stutters severely.

In the present study, all the SLPs showed 100% accuracy while diagnosing severe and very severe stuttering across languages, familiar and non-familiar and genetically and non-genetically related. However, reduced accuracy was shown while diagnosing mild and moderate stuttering. This is in agreement with findings of Cosyns, Einarsdóttir and Borsel (2015) who stated that higher the stuttering severity, the greater is the chance of diagnosing sample accurately. When the severity is mild to moderate, there is more influence of language familiarity and closeness of the language of the sample to be analyzed with the native language of the SLP.

The results of the present study suggested that both native and non native SLPs could accurately rate stuttering severity when a client is severely stuttering. In case of mild to moderate stuttering, accuracy increased when ratings were made by an experienced native SLP or an experienced SLP whose mother tongue was close to the client's language.

IV Rate of speech and speech naturalness

Rate of speech was the next domain analyzed. There was a great variability seen in assessment done by Indo-Aryans assessing Dravidian languages compared to Dravidian clinicians analyzing the Dravidian samples. There was significant difference in assessment of rate of speech and speech naturalness by SLP 1K, SLP 2M and SLP 3H while analyzing the Kannada samples. The probable reason could be that the rate of speech might be a contributing factor for determining the familiarity of a language to the native language of the SLP. More familiar language would yield in better estimation of rate and speech naturalness.

Also, analysis of speech naturalness varied across the different severity levels. More severe the stuttering poorer is the speech naturalness and hence can be estimated accurately only if the stuttering is severe.

V Ease of analysis

The last aspect studied was ease of rating of different language samples. Here, results suggested that SLPs showed greater ease in analyzing genetically related languages compared to non-genetically related languages. This is supported by Borsel and Pereira (2005) who found that raters were less confident and expressed more difficulty in assessment of stuttering in a foreign compared to native language. Ease of rating is essentially influenced by familiarity and closeness of the language. The more familiar a rater is with the language to be judged and the

closer this language is to the rater's native language, the easier it will be for him/her to judge stuttering severity.

Nevertheless, the results of the present study suggest that both native and non native SLPs can accurately rate stuttering severity when a client is severely stuttering. In case of mild to moderate stuttering, accuracy is increased when ratings are made by an experienced native SLP or an experienced SLP whose mother tongue is close to the client's language. This highlights the need for developing and evaluating stuttering measurement training programmes in different languages. It is advised that these training packages have a focus on the identification of mild to moderate stuttering.

It should be reminded that the participants in the present study were aware that the speech samples they were going to rate were all of stuttering. Therefore, caution is recommended when generalizing the present findings to situations where it has to be determined whether or not a person speaking a foreign language is stuttering or not. This becomes particularly valid when the samples include very mild and mild stuttering. Taking into account the study of Borsel and Pereira (2005) and Borsel et al, (2008), it is hypothesized that the interplay between stuttering severity, language closeness, language familiarity, and experience is crucial for the accurate diagnosis of stuttering.

Chapter 6

Summary and conclusion

Several studies have focused on the identification of stuttering behaviors and assessment of stuttering severity in a foreign language. Most of them have considered language familiarity as a determining factor for accuracy in assessment. However, language familiarity of the clinician / SLP is not the only factor involved. The scenario appears to be more diverse in analyzing stuttering behaviors, showing an interconnection between different factors such as 1) familiarity of the clinician with the language of the client, 2) closeness of the clinician's language to that of the client, 3) stuttering severity of the client and 4) experience of the clinician in stuttering assessment.

Among these factors, stuttering severity can be considered as the most prominent factor in assessing stuttering in different languages. Nevertheless, the results of the present study suggest that both native and non native SLPs can accurately rate stuttering severity when the client's stuttering is severe. Also, less experienced clinicians can also make correct diagnosis when the severity is more. However, in case of mild to moderate stuttering, accuracy is increased when ratings are made by an experienced native SLP or an experienced SLP whose mother tongue is close to the client's language. In contrast, closeness of the languages like genetically related languages (which has come from one origin) can play a major role only if raters are experienced and the stuttering severity is of mild to moderate level.

Ease of rating stuttering severity, speech rate and speech naturalness is, on the other hand, primarily associated with language familiarity of the clinician, closeness of the language of the client to the clinician's native language, stuttering severity and the experience of the clinician

Clinical Implication:

The following implications can be suggested from the following study

- 1) Importance of language familiarity in stuttering assessment.
- 2) Importance of closeness to the native language of the rater and experience of the Speech-language pathologist in diagnosing stuttering in an unfamiliar language.
- 3) Need for developing and evaluating stuttering measurement training programmes in different languages. It is advised that these training packages have a focus on the identification of mild to moderate stuttering.

Limitation

In the present study, the number of speech samples from each language is limited. More speech samples within each severity category could yield more authentic results. Also, analyses of stuttering samples in unfamiliar languages by sufficiently large number of Speech Language Pathologists could help to substantiate the hypothesis that language familiarity influences the accuracy in diagnosing stuttering.

Future Direction

Future studies can be employed to probe into more language specific stuttering assessments, across different Indian language classes as studies on language familiarity and stuttering assessment is very limited in Indian scenario.

Also, analyses can be focused on identifying the specific dysfluency types which are more robust in estimating stuttering severity irrespective of the language familiarity.

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