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Speech Disfluencies Among Adults During Class Presentation

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I. INTRODUCTION

Speech is defined as the audible manifestation of language. Speech production involves manipulation of mouth, tongue, cheeks and throat along with the shaping and control of air to produce specific vowel and consonant sounds.

Fluency is the aspect of speech production that refers to smooth, forward –moving, unhesitant and effortless speech. Stark whether (1980) stated that fluency is the continuous effortless speech at a rapid rate of utterance. The term "fluent & fluency" normally refers to a general proficiency in the act of speaking and writing. The term fluency is derived from the latin root "fluere". It refers to many things but seems to in communication to the smooth and easy flow of utterance.

Fluency can be categorized into 2 types namely Speech fluency and language fluency. Speech fluency refers to the production of speech at normal level of skills. Language fluency refers to the syntactic, semantic and pragmatic fluencies as well as phonological fluency. Syntactically fluent speaker are able to construct highly complex sentences. Semantically fluent speakers are able to access large vocabularies. Pragmatically fluent speaker are adept at verbal responses in a variety of speaking situations. Phonologically fluent speaker are able to pronounce long and complicated sequences of sounds and syllables including nonsense and foreign words.

The dimension of fluency includes continuity or smoothness of speech, Rate of speech and Effort a speaker makes in producing speech. All these are very broad categories, each of which consists of several variables (Stark weather, 1981). He again suggested a fourth category, i.e. Structure (Stark weather, 1982). Continuity, Rate & Rhythm are traditionally been considered as aspects of speech timing. Effort is the primary dimension of fluency (Stark weather, 1982) and timing variables are secondary simple reflection of effort. Normal speakers may pause, edit, hesitate and revise their thoughts without being referred to a Speech Language Pathologist. Disfluencies are a part of normal speech. Normal disfluencies reflect a temporary stage of language learning and communication development. Studies have done which explores the disfluencies in children as well as in adults.

Duchin & Mysak (1987) explored that in young adult group of 21-30 years, speech rate differed significantly in decreasing order for oral reading, conversation and picture description.

Nagapoornima, (1990); Indu, (1990) Yamini, (1990) and Rajendraswamy (1991) developed a fluency test in Kannada based on their study in different age groups. While Nagapoornima (1990), studied disfluency data of 12 children in the age groups of 3-4 years, Indu(1990); Yamini (1990); and Rajendraswamy (1991) studied disfluencies of children aged, 4-5, 5-6 and 6-7 years accordingly. They used simple pictures, cartoons and pictures depicting Panchatantra stories to record speech sample for further disfluency analysis. They considered a total disfluency of greater than 25 – 30 % as abnormal. The percentages of disfluency reported in these studies are high as they considered each Disfluencies in 3 to 5 Years Old Telugu Speaking Normal Preschool Children

Jocine, Fernandis & TA Rao (2009) studied disfluencies in 4-5 year old normal bilingual children and concluded that the type of disfluencies present in English speaking Indian children are filled pauses, interjections, word repetitions, prolongations and phrase repetitions. Chacko (2008) studied speech disfluencies in normal Indian adults and concluded that type of disfluencies present in adults is quite normal and do not affect speech considerably.

Studies have been carried out to explore the disfluencies in children as well as in adults. But limited studies have been reported describing the disfluencies in typical adults during class presentation which will give us an insight in distinguishing between normal fluency versus stuttering. Hence the present study has been attempted to report the disfluencies during class presentation among adults.

II. REVIEW OF LITERATURE

Normally fluent speech may not be a perfect speech. Normal speakers may pause,edit,hesitate and revise their thoughts without being referred to a Speech Language Pathologist.Disfluencies are a part of normal speech.The term disfluency refers to the non-fluent speech of people who do not stutter.However when speaker uses the boundary from normal disfluencies to abnormal disfluencies they are exposed to the negative evaluations of their listeners. Each of us carries within us a model of exactly what is acceptable and unacceptable in terms of fluent and non-fluent speech.

One may not be able to define normal speech in terms of its inherent disfluencies but one may able to know whether or not Speechmeet one's standards of expected fluency.

Disfluency has been defined by the American Speech Language and Hearing (ASHA,1999) as speech that exhibits deviations in continuity,smoothness,ease of rate and effort .Non fluency is one of the several components of a speech task which initiate the event of disruptions in the ongoing flow of speech.

The compiled characteristics of disruptions of fluent speech include:

1) Filled pauses such as 'uh', hmm' which are distinct from sounds and words associated with the fluent text. It can occur once or more. The number of times the pauses are repeated will be counted to account for the disfluency.
2) Unfilled pauses are characterized by silence which affects the smooth flow of speech.
3) Repetitions may be syllable repetition,part word repetition, word repetition,phrase repetition and sentence repetition
4) Parenthetical remarks characterized by fillers like that, this, then, later, you know etc.
5) Revisions in which content of the phrase will be modified syntactically and semantically
6) Prolongations in which the person prolongs the speech which in turn disturbs the normal rhythm

The above mentioned disfluencies may not always make a person to stutter. Most people experience instances of disfluency in their speech that would not be considered as stuttering. Normal disfluencies reflect a temporary stage of language learning and communication development. Distinguish between disfluencies that are normal and those that represent the danger of incipient stuttering is a critical skill for Speech Language Pathologist.

A. Western Studies

Broen (1972) studied Variations in Normal Speech Disfluencies. In his study 40 college adults were asked to speak in each of three situations. All subjects started in an alone situation in which they simply talked spontaneously about any topic while sitting alone in a room. They then participated in a situation in which they were asked to speak alone in front of a TV camera and lights, or as if to an audience (Audience-TV situation). Finally, the experimenter entered the room and engaged the subject in casual conversation for the final situation. Each situation was 12 minutes and was tape recorded. After the last session, the subjects filled out a brief questionnaire in which they rated each situation according to their judgment of the need to speak carefully and of their estimated disfluency in the situation. The most significant finding is that subjects were most disfluent in those situations they rated as least important. Contradictory to usual observations, the greatest frequency of disfluencies occurred in the conversation rather than the Audience- TV situation. It appeared that as subjects became more concerned about their speech, they monitored it more carefully and thus became more fluent.

Mysak&Duchin (1987) studied the disfluency and rate characteristics across adults. They grouped the adults into five separate groups according to their corresponding age as young adult (21-30 years), two groups of middle aged (45-54 years and 55-64 years) and two groups of older males (65-74 years and 75-91 years). The primary objective was to determine whether there was any significant difference among groups in terms of rate and disfluency measures during three tasks namely: oral reading, picture description and conversational speech. The results revealed that speech rate during each of the speaking tasks differed significantly among three age groups and it differed significantly in decreasing order, for oral reading, conversation and picture description irrespective of the age group. Levels of disfluency did not appear to differ among the various age groups.

Silverman & Ratner (1996) did a study on Syntactic Complexity, of Sentence Imitation in Adolescents. 14 Fluency, and Accuracy adolescents, 7 of whom stuttered, and 7 of whom were normally fluent, ages 10-18 years participated in a sentence imitation task in which stimuli were divided into three classes of grammatical complexity. Results indicated that for both groups of speakers, normal disfluencies and errors in repetition accuracy increased as syntactic complexity increased. However, stuttering frequency did not appear to be affected by changes in the syntactic complexity of the target stimuli. Such findings suggest either a diminution of the effects of syntactic complexity on stuttering over the course of language acquisition or changes in the mix of chronic and non chronic stuttering speakers from those used in earlier studies of the effects of linguistic structure on stuttering in children.

Mc Clowry& Max (1997) investigated age related effects on speech disfluency. They compared disfluencies of a 105 year old woman to the means of several geriatric groups whose average age were more than 20 years younger. Overall frequencies and types were similar. Thus aging speaker fluency does not appear to be more susceptible to breakdowns than that of younger speakers, although there is some evidence that elderly speakers become much more disfluent than younger speakers under stressful conditions.

Mysak & Duchin (1987) studied the disfluency and rate characteristics across adults. They grouped the adults into five separate groups according to their corresponding age as young adult (21-30 years), two groups of middle aged (45-54 years and 55-64 years) and two groups of older males (65-74 years and 75-91 years). The primary objective was to determine whether there was any significant difference among groups in terms of rate and disfluency measures during three tasks namely: oral reading, picture description and conversational speech. The results revealed that speech rate during each of the speaking tasks differed significantly among three age groups and it differed significantly in decreasing order, for oral reading, conversation and picture description irrespective of the age group. Levels of disfluency did not appear to differ among the various age groups.

Ballmer (2002) analyzed The Effects of category and rhyme decisions on sentence production and investigates differences between persons who stutter and persons who do not stutter during the production of sentences in a single task versus two dual-task conditions. The results suggest that persons who stutter require more processing capacity for sentence generation and articulation than persons who do not stutter and that both groups keep stuttering rates at a constant level by adjusting the number of propositional units of their linguistic productions. The results also support the view that the organization of the speech-production system of persons who stutter makes it more vulnerable to interference from concurrent attention-demanding semantic tasks.

Ja & Ja (2003) reported that speech rate, fluencyand the type of dis fluencies observed in normal adults of age range 17-36years to provide basic information on normal speaking. The rate was measured as syllable per unit (SP). The speech rates in reading ranged between 273-426 with a mean of 348 SPM and in speaking ranges 118-409 (mean=265). The average of their fluencies was 99.1% in reading and 96.9% in speaking. The disfluency types were also analyzed from 150disfluency episodes. Syllable repetition and word interjections were the most common disfluencies observed in the study.

Carlo & Watson (2003) examined the disfluent speech of 32 normally fluent monolingual, Spanish-speaking children from Puerto Rico. The total frequencies and types of speech disfluencies were examined in 15 children (8 girls and 7 boys) aged 3;5-4;0 years (M=3.76) and 17 children (8 girls and 9 boys) aged 5;0-5;5 years (M=5.18). When examining the total frequencies of speech disfluencies, results revealed no main effects for age or gender as well as no interactions. Moreover, no differences were observed between the age groups in most of the disfluency types, including the rank orders of the types. Revisions, interjections, and single-syllable word repetitions were the most frequently observed speech disfluencies for both age groups. Broken words, blocks, and repetitions of more than one syllable were the least frequent. Overall, results revealed both similarities and differences when compared with the reported speech behaviors of English-speaking children.

Merlo, Mansur &Holanda (2004) investigated topic familiarityand disfluencies during oral descriptive discourse of adult speakers. Results revealed that participants expressed more attributes when thetopic was familiar than it was unfamiliar. Fillers and lexical pauses werethe most common disfluencies noted. Repetitions, hesitations, pauses andprolongations were shown to have the same role, which was distinct fromthe role of fillers.

Natke, Sandrieser, Pietrowsky & Kalveram (2006) studied the Speech disfluencies of 24 German speaking preschool children whostutter and 24 gender and age matched comparison children who do notstuttered phrase. Speech samples were transcribed orthographically andanalyzed using the computer program. Five types of disfluencies werenoted: prolongation, blocks and repetitions of sounds and syllables bothin stuttered and normal population.

Eggers & Van Edenberg (2018) conducted a study on speech disfluencies in children with Down syndrome and concluded that approximately 30% of children with Down syndrome between 3 and 13 years of age group stutter, which is much higher than the prevalence in normally developing children.

Kourkounakis & Hajavi (2020) conducted a study on Detecting Multiple Speech disfluencies using a deep residual network with bidirectional long and short term memory layers to classify different types of stutterers and achieve an average miss rate of 10.03%, outperforming the state of the art by almost 27%. Silven, Lehito & Eggers (2020) researched on Speech disfluencies in typically developing Finnish speaking children and results showed that there were no significant changes noticed within age for the total frequency of disfluencies or disfluency types among the 2-4 years old children, also the preliminary results suggest that different guidelines are needed for defining normal disfluency from stuttering in different languages.

B. Indian Studies

Mathuranath, George, Cherian, Alexander &Sarma (2003) studied the effects of age, education and gender on verbal fluency in cognitively unimpaired older individuals. Categorical and letter fluency tasks were given in their native language, Malayalam. Results revealed that level of education but not age or gender significantly influences letter fluency. Level of education and age affects categorical fluency in the elderly subjects. Age but not education has a differential effect on the tasks of verbal fluency, influencing categorical fluency more than letter fluency.

Anjana&Savitri (2007)studied disfluencies in 5.1 to 6 yr old Kannada speaking children by frequency and types of disfluencies and effect of gender on disfluencies. Results showed that majority of the children had almost all the Disfluency types. The most prominent disfluency type was sound repetition.

Thomas (2006) studied the common disfluencies observed in 22-25 year old Indian adults who use spoken English. Speech samples were collected for 2 minutes, each for 3 different conditions; reading, monologue and general conversation. In conclusion, there were mainlyfive types of disfluencies that were observed in them- pauses, repetitions, interjections, revision and prolongations; which do not affect the speech considerably but are present since an increased planning time is required for the rapid flow of speech. She concluded that type of disfluenciespresent in adults is quite normal and do not affect speech considerably.

Jocine, Fernandis& Rao (2009) studied dis fluencies in 4-5 year old normal bilingual children and concluded that the type of disfluencies present in English speaking Indian children are filled pauses, interjections, word repetitions, prolongations and phrase repetitions.

Rathika, Kanaka, Sunila & Rajashekhar (2012) analyzed the disfluencies in 48 Typically Developing Tamil Speaking Children between 4 - 8 Years (with 12 children in each age group. A total of seven types of disfluencies were identified. It includes filled pauses (pauses filled with sounds like "'mm"'..." um" etc); unfilled pauses (silent pauses having duration greater than 300 ms); repetition (repetition of sounds, syllable repetition (repetition of syllable), part word repetition, whole word repetition, phrase repetition, parenthetical remark, false starts, audible inspiration, and prolongation. Total percentage of disfluencies and percentage of individual disfluency types were calculated. The results indicated pauses to have highest percentage of disfluencies in all the age groups.

Bailoor, John &Laxman (2015) studied disfluencies in English speaking young adults of the age range of 18-20 years. The result of this study reveals that the proportions of filled and unfilled pauses are predominant in both conversational speech and monologue tasks.

Mahesh & Geetha (2015) investigated on Phonetic environment of disfluencies in children with stuttering the present study is aimed to analyze the effect of phonological environment during the instances of stuttering. The study included 10 monolingual children with stuttering (CWS) in the age range of 6–8 years, who spoke Kannada (south Indian language) as their mother tongue. Conversation, topic narration, story narration, and picture description tasks were carried out in Kannada language. Findings also revealed variability in the occurrence of phonetic context within and between CWS, which supports the disturbances occurring across various time domains. It is hoped that the findings of the current study will support theorists, researchers, and clinicians in arriving at a more comprehensive understanding of stuttering and phonetic behavior in CWS.

Abraham, Sara, Kumaraswamy, George, Janet & Arya (2015) analyzed on Pause Duration in Typically Developing Malayalam Speaking Children the study included 15 subjects, aimed the difference in filled and unfilled pause duration in typically developing Malayalam speaking children across the age group of 6-8years in tasks including conversation and picture description. The study reveals that there is not much variation in the filled pause duration whereas the unfilled pause showed a consistent general progression across the age group for conversation task. In picture description task, there was no significant difference for the filled and unfilled pause duration across the age group.

Mahesh, Sangeetha, Raju & Reny (2020) examined the Effect of syllable complexity on speech disfluencies of kannada speaking adults who stutter study aims to investigate the effect of syllable complexity (words with and without consonant clusters) WWCC on the speech disfluencies of Kannada speaking adults who stutter. Thirty Kannada speaking adults with stuttering in the age range of 18 to 30 years were considered. A standardized Kannada reading passage constituting of words with and without consonant clusters was used. Results indicated that words with and without consonant clusters) WCC had higher percentages of disfluencies as compared to (words with consonant clusters) WWCC in adults with moderate as well as severe stuttering. However, these findings were not statistically significant. Also, cluster disfluencies on words with consonant clusters were observed to be greater in adults with severe stuttering when compared to adults with moderate stuttering.

Pachaiappan, Sowmiya, Cherkuri & Ramya (2021) studied on Fluency is that the effortless production of long continuous utterances at a rapid rate. Disfluency or non-fluency suggest disruptions within the timing and flow of non-stuttered speech like interjections and phrase repetitions that are often perceived as being a part of the traditional interruptions of speech.

Garg, Mehrotra, Krishna &Vuppala (2021) investigated in detection and removal of disfluencies from speech is an important task since the presence of disfluencies can adversely affect the performance of speech-based applications such as Automatic Speech Recognition (ASR) systems and speech-to-speech translation systems. From the perspective of Indian languages, there is a lack of studies pertaining to speech disfluencies, their types and frequency of occurrence. Also, the resources available to perform such studies in an Indian context are limited. Through this paper, we attempt to address this issue by introducing the IIITH-Indian

English Disfluency (IIITH-IED) Dataset. This dataset consists of 10-hours of lecture mode speech in Indian English. Five types of disfluencies - filled pause, prolongation, word repetition, part-word repetition and phrase repetition were identified in the speech signal and annotated in the corresponding transcription to prepare this dataset.. Two sets of features were extracted from the speech signal and then used to train classifiers for the task of disfluency detection. Amongst all the systems employed, Random Forest with MFCC features resulted in the highest average accuracy of 89.61% and F1-score of 0.89.

C. Need Of The Study

Studies have been carried out to explore the disfluencies in children as well as in adults. But limited studies have been reported describing the disfluencies in typical adults during Class presentation which will give us an insight in distinguishing between normal fluency versus stuttering. Hence the present study has been attempted to report the normal fluency during Class presentation among adults.

III. METHOD

A. Aim Of The Study

The present study aim to analyze the speech disfluencies in typical adults during Class presentation

B. Participants

Thirty English speaking adults in the age range of 22-25 years were selected for the study. The selected subjects did their schooling in English medium till 12th standard and had English as their first language in their entire length of education.

All subjects were screened for the structural and functional integrity of the oral speech mechanism and only those with adequately functioning oral speech mechanism were considered for the study. Subjects with hearing loss, intellectual problemsand neurological deficits were excluded from the study.

C. Test Environment

The Class presentation session was recorded in classroom settings using a smart phone with external microphone. Each subject's presentation was recorded individually for 15-20 minutes.

D. Procedure

Class presentations recorded was transcribed. The number of words and disfluencies were noted and marked. The disfluencies were categorized as repetitions, prolongation, silent pauses, audible pauses, hesitations, interjections and revisions and the number of disfluencies were calculated in percentage. Percentage of each disfluency was calculated as the ratio of number of disfluencies to the total number of utterances multiplied by 100. Later statistical analysis was done and the mean, median and standard deviation were calculated for the overall disfluencies observed in the sample for each subject. Later the scores were subjected to a non-parametric statistical analysis and the results were computed in a tabular form as well as in figurative form.

IV. RESULTS

From the study the numbers of disfluencies noted were repetitions, prolongations, silent pauses, audible pauses, hesitations, interjections and revisions. Using the Friedman test, the mean, median and standard deviation were calculated for each disfluencies to check for the maximum number of disfluency. The values were compared using the Wilcoxon signed rank test to check if there was significant difference between the disfluencies noted. Below are the values in a tabular form.

Table 4.1

Showing the mean, standard deviation and significant value of the disfluencies in typical adults.

	N	Mean	Std. deviation	Median (IQR)	Friedman test	
					value	P value
Repetition	30	1.40	0(0-2.25)	0(0-2.25)	136.640	P< 0.001
Prolongation	30	1.94	0(0-1)	0(0-1)		HS
Silent pauses	30	4.68	8(5-13)	8(5-13)		
Audible pauses	30	5.43	22 (18.5)	22(18.5)		
Hesitations	30	4.40	8.5(5-12)	8.5 (5-12)		
Interjections	30	5.43	6.5(5-9)	6.5(5-9)		
Revisions	30	4.40	6.5(4-8)	6.5(4-8)		

Figure 4.1
Showing the mean value for disfluencies in typical adults.

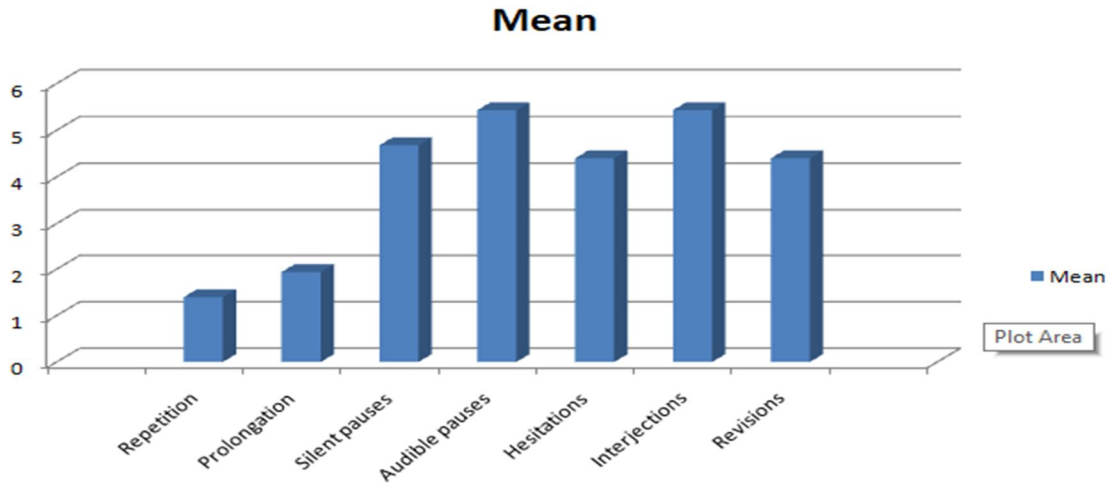

Table 4.1 and figure 4.1 shows the mean, median and standard deviation values of disfluencies in thirty subjects. From the figure and graph it is clearly identified that mean values for audible pauses were found to be more which is followed by silent pauses, hesitations, interjections, revisions, repetitions and prolongations and the mean value is found to be highly significant ($p<0.001$).

Table 4.2
Showing significant values for disfluencies comparisons in typical adults.

	Wilcoxon Signed rank test p value	
Prolongations-Repetitions	.123	NS
Silent pauses- Repetitions	p<0.001	HS
Audible Pauses- Repetitions	p<0.001	HS
Hesitation- Repetitions	p<0.001	HS
Interjection- Repetitions	p<0.001	HS
Revision- Repetitions	p<0.001	HS
Silent pauses- Prolongation	p<0.001	HS
Audible Pauses- Prolongation	p<0.001	HS
Hesitation- Prolongation	p<0.001	HS
Interjection-Prolongation	p<0.001	HS
Revision – Prolongation	p<0.001	HS
Audible Pauses- Silent pauses	p<0.001	HS
Hesitation- Silent pauses	.589	NS
Interjection-Silent pauses	.041	Sig
Revision – Silent pauses	.004	HS
Hesitation- Audible pauses	p<0.001	HS
Interjection-Audible pauses	p<0.001	HS
Revision – Audible pauses	p<0.001	HS
Interjection- Hesitations	.233	NS
Revision – Hesitations	.007	HS
Repetition- Hesitations	.055	NS

From table 4.2, It can be seen that highly significant values were obtained when compared silent pauses versus repetition ($p<0.001$), audible pauses versus repetitions ($p<0.001$), hesitations versus repetitions ($p<0.001$) interjections versus repetitions ($p<0.001$) revision versus repetition ($p<0.001$) silent pauses versus prolongations ($p<0.001$), audible pauses versus prolongations ($p<0.001$), hesitations versus prolongation ($p<0,001$), interjection versus prolongations ($p<0.001$), revisions versus prolongations ($p<0.001$), audible pauses versus silent pauses ($p<0.001$), revision versus silent pauses ($p<0.001$), hesitations versus audible pauses ($p<0.001$),interjection versus audible pauses ($p<0.001$) revisions versus audible pauses ($p<0.001$) and revision versus hesitation ($p<0.001$). Significant value is observed when compared interjection versus silent pauses ($P=0.04$). Non significant values were observed when compared to prolongations versus repetition ($p=0.123$), hesitation versus silent pauses ($p=0.589$), interjections versus hesitations ($p=0.233$) and revisions versus interjections ($p=0.055$).

V. DISCUSSION

Study of disfluencies in typical speakers is of interest to speech language pathologist because on the continuous fluency, abnormal fluency point arises. The present study has demonstrated that the typical adults speakers in the age range of 22-25 years demonstrated a large number of disfluencies noticeably audible pauses and silent pauses. When types of disfluencies were compared, audible and silent pauses were the most frequent types. Marlo (2004) demonstrated that pauses are the most significant disfluency type seen in adults and the present study support the findings.

Swamy (1991) studied disfluencies of 12 normal Kannada speaking children and found that filled pauses occurred more frequently followed by parenthetical remarks and repetitions and the present study support these findings.

The present study has thrown a light on the disfluency of normal speakers especially in adults of age range 22-25 years. The most common disfluencies seen were audible pauses, silent pauses, hesitations interjections and revisions.

VI. SUMMARY AND CONCLUSION

The main objective of the present study was to analyze the disfluencies that are seen in 22-25 years typical adults during Class presentation. It aimed to trace the most common disfluencies seen when Indian adults use spoken English especially during Class presentation.

Speech samples were collected using a smart phone and transcribed it later to analyze the disfluencies. The number of words and disfluencies were calculated in percentage.

Using the Friedman test, the mean, median and standard deviation were calculated for each disfluency to check for the maximum number of disfluency. The values were compared using the Wilcoxon signed rank test to check if there was significant difference between the disfluencies noted. The numbers of disfluencies observed were silent pauses, audible pauses, hesitations, interjections, revisions, repetitions and prolongations. Among these disfluencies audible pauses and silent pauses were the most commonly seen and repetitions and prolongations were the least commonly observed disfluencies.

Marlo (2004) demonstrated that pauses are the most significant disfluency type seen in adults and the present study support the findings.

Swamy (1991) studied disfluencies of 12 normal Kannada speaking children and found that filled pauses occurred more frequently followed by parenthetical remarks and repetitions and the present study support these findings.

Hence we can conclude that the types of disfluencies present in English speaking Indian adults are pauses, hesitations, interjections and revisions. But these disfluencies do not affect speech considerably but are present because increased planning time is required for the forward rapid flow of speech.

A. Limitations Of The Study

1) Number of subjects were limited
2) Sample was not recorded using a software instead it was recorded using a smart phone.
3) Only audio samples were considered.

B. Suggestions For The Future Research

1) Comparison of disfluencies in English and other languages can be studied.
2) Comparative study between fluent speakers versus adult stutterers on type of disfluencies.
3) Video recording can be done for the precise judgment.
4) Duration of pauses can be studied extensively.

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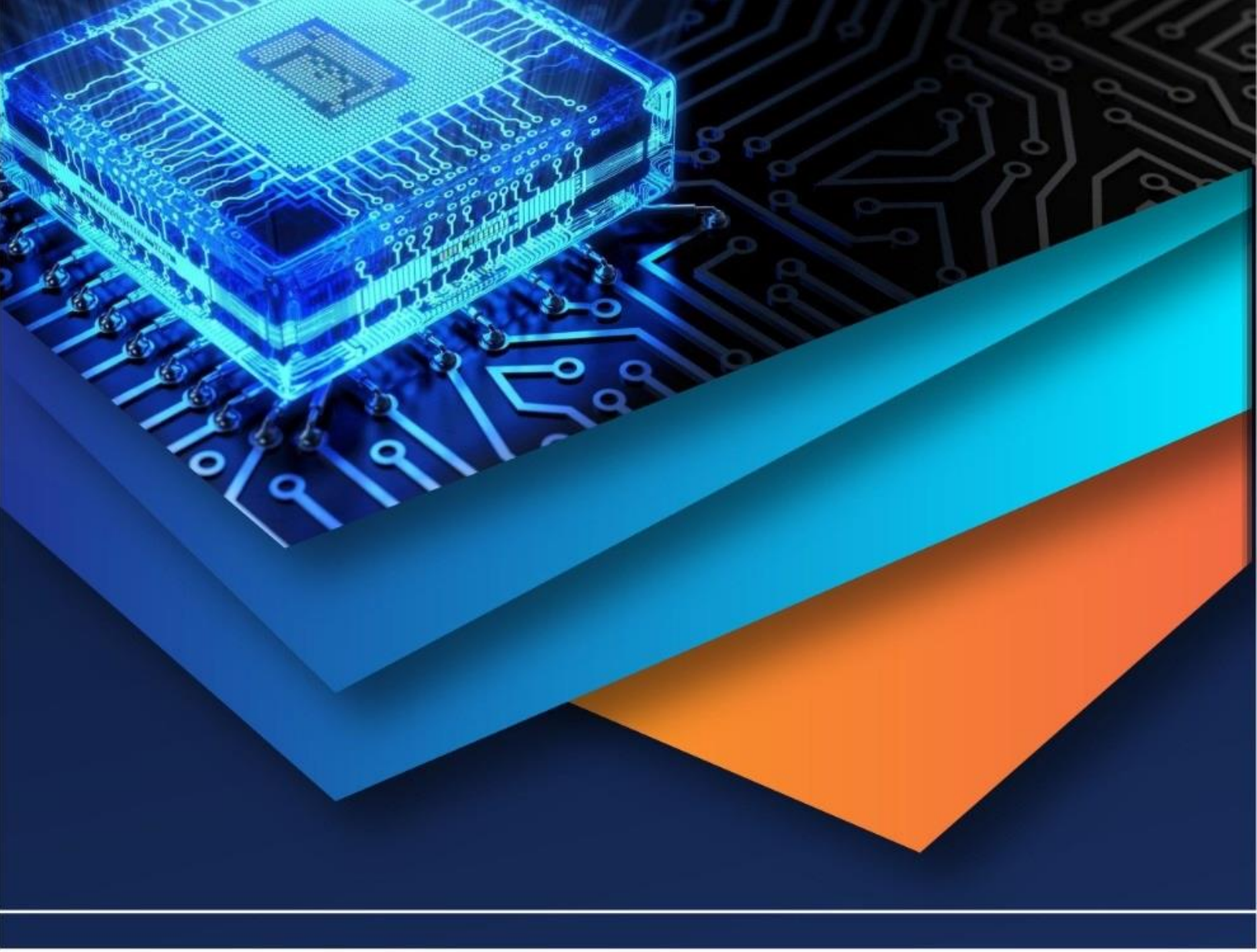

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