SELF-RATED AND CLINICIAN-RATED PARAMETERS OF SPEECH EFFORT IN STUTTERING

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SEPTEMBER 2021

CERTIFICATE

This is to certify that this dissertation entitled "**Self-Rated and Clinician-Rated Parameters of Speech Effort in Stuttering**" is a bonafide work submitted in part fulfillment for the degree of Masters in Science (Speech-Language Pathology) of the student Registration Number: 19SLP034. This has been carried out under the guidance of the faculty 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 "**Self-Rated and Clinician-Rated Parameters of Speech Effort in Stuttering**" is the result of my own study under the guidance of Dr. Anjana B Ram, Assistant Professor in Speech Pathology, 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.

Mysuru   **Registration No.: 19SLP034**

September 2021

Dedicated to
Appaji, Amma &
My Well-wishers....

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CHAPTER 1

Introduction

Speech is said to be fluent when there is a smooth flow from word to word, phrase to phrase to phrase, or sentence to sentence without interruption. Fluency is the ability to produce long, uninterrupted utterances at a rapid rate effortlessly. The four fundamental dimensions of fluency proposed by Starkweather (1987) are continuity, rate, rhythm, and effort. He noted that continuity, rate, and rhythm are associated with speech timing aspects and argued that each is subordinate to effort. The utterance that a listener perceives to be highly effortful features deviations in the continuity, rate, and rhythm of what a speaker has said. In both content and production, fluency refers to non-stuttering, forward-moving communication. Normal fluency has been defined in terms of four variables or characteristics: the absence of stuttering events, speech rate within a normal range, normal overall naturalness of speech, and normal levels of physical and cognitive effort on the part of the speaker. The speech of a person with stuttering is associated with core behaviors as well as secondary behaviors, as noted by Starkweather (1987). Core behaviors are sound or syllable repetition, prolongations, and blocks. Eye blinks, facial grimacing, and variations in pitch or volume are examples of secondary behaviors. Other actions such as physical tension or struggle, negative reaction or frustration, and avoidance behaviors may be associated with their speech (e.g., reduced verbal output or situational avoidances).

Individuals who stutter exhibit both overt and covert behaviors. Overt behaviors are visible and audible to the listeners. The gold standard for evaluating the effectiveness of stuttering treatment methods is counting demarcated overt

stuttering behaviors (Bloodstein, 1995). However, overt actions that are visible and audible are only a tiny part of the stuttering syndrome, similar to the tip of the iceberg (Sheehan, 1970). Covert stuttering behaviors are those that are neither perceptible to the listener nor can be measured using sophisticated measurement instruments at the peripheral speech production system, such as Respitrace, Electromyography (EMG), Photoglotography (PGG), Electropalatography (EPG), and so on (Saltuklaroglu & Kalinowski, 2002). Linguistic avoidances, substitutions, and circumlocutions are examples of covert stuttering within the central nervous system (Van Riper, 1982; Bloodstein, 1995).

1.1 Speech effort and stuttering

Ham (1990) defined disfluency as speech which is generated with effort, more discontinuous than usual, or when the discontinuities are immature, when the rhythm of speech is atypical, or when it is not serving the speaker by making speech production easier. For the most part, stuttering therapy eliminates the signature events of repetitions. On the other hand, the signature events of effortful, artificial-sounding, and prolonged speaking exist and appear to be universal. This is most likely why persons who stammer refuse to employ the abnormal speech production pattern that clinicians refer to as fluent speaking outside the therapeutic setting.

Minimal speech effort has been included in definitions of fluent Speech (Starkweather, 1987), and for that reason, a measure of speech effort would be informative for therapy. Unlike fluent speaking, stuttered speech is often effortful, which can be mental effort or physical effort. Physical effort is the amount of muscular energy a speaker expends when speaking, whereas mental effort is the amount of thought or attention a speaker gives while speaking (Hoit et al., 2007).

Physical effort and speech naturalness were studied and compared in a study done by Ingham et al. (2009) in four fluency-inducing conditions like Masking, whispering, rhythm, and chorus reading. A person without stuttering reported increased effort, and PWS reported reduced stuttering and speech effort in Masking, whispering, and rhythmic speech; however, at the cost of a significant loss of speech naturalness. Chorus reading was the only fluency-inducing condition that improved stuttering frequency and speech effort without losing Speech naturalness.

The authors did a similar kind of research by investigating phonatory behavior during oral reading in persons who stutter (PWS) and normally fluent controls under a variety of fluency-inducing (FI) conditions. Twelve adults with persistent stuttering served as participants in the PWS group, and twelve normally fluent speakers served as participants in the control group. Speech effort was self-judged, and the observer judged the stuttering frequency, speech rate, and speech naturalness. They reported a reduction in stuttering and short phonated intervals compared to the baseline condition while using all fluency-inducing conditions, but chorus reading was the only FI condition that satisfied all four features of naturally fluent speech (Ingham et al., 2012).

A person with stuttering may be achieving fluency by careful monitoring, at the cost of intense effort to avoid dreaded and feared words and situations, and experiencing a sense of anxiety and feelings of being out of control. The PWS may even view his fluent speech as being disfluent. These internal perceptions and dynamics could contribute to the difficulty of achievement and maintenance of fluency. Riley et al. (2004) used Subjective Screening of Stuttering, a self-reporting

instrument about internal feelings of Persons with stuttering, and highlighted the importance of the information derived in stuttering treatment planning.

Lipped speech, whispered speech, prolonged speech, and syllable stretched speech, according to Wingate (1976) and others, are all part of the fluent speech set; however, other authors argue that this is inappropriate (Kalinowski & Dayalu, 2002). Fluent speech is defined as "the ability to speak at normal levels of continuity, pace, and effort" and is effort-free, natural-sounding, and perceptually similar to fluent speech produced by people who do not stutter (Kalinowski & Dayalu, 2002).

1.2 Need for the study

Stuttering is a disorder characterized by both overt and covert behaviors. The overt behaviors can be studied and measured by the speech and language pathologists. However, it is the covert behaviors that become extremely difficult to assess and quantify. The overt behaviors may contribute to the physical effort, and the mental effort may be an indirect interpretation of the covert behaviors of stuttering. It is essential to get information about a patient's covert feelings to aid in successful rehabilitation. A Self-reporting inventory would be a tool to provide such information.

Effortless smooth flow of words, phrases and sentences is one important feature of fluent speech. However, in a person with stuttering the effort can depend on various factors like situation, individual, emotional states etc. It is also important to probe the effect of the fluency-inducing conditions on speech effort. There is scant literature related to this and thus the need for investigating speech effort as an indirect attribute of covert behaviors in persons with stuttering.

1.3 Aims of the study

This study aims to develop self-rated and clinician-rated inventories (questionnaires) to study the overt and covert behaviors in relation to speech effort in Persons with stuttering.

1.4 Objectives of the study

1.   To develop self-rated and clinician-rated inventories of speech effort.

2.   To compare the rating of persons with stuttering with the observation of speech and language pathologists. Along with the clinician, the examiner (investigator of the study) also rated the questionnaire to check the inter-rater correlation of the results.

3.   To study the factors contributing to speech effort in persons with stuttering.

CHAPTER 2

Review of literature

Stuttering is a disorder in which the smooth, forward flow of speech is disrupted. It has a high heterogeneity and variability across different speaking situations and communication partners. Speech effort is an essential aspect of defining stuttering. Fluency is the effortless production of speech at a rapid rate. The present review throws light on studies on speech effort in relation to stuttering.

2.1 Speech effort and stuttering

Few authors examined the changes in stuttering frequency, speech rate, speech naturalness, and speech effort when the frequency of voluntary stuttering was varied. Participants were asked to read four 300-syllable passages in 2 conditions, i.e., during a control condition and three voluntary stuttering conditions that involved attempting to produce purposeful, tension-free repetitions of initial sounds or syllables of a word for two or more repetitions. According to their results, the stuttering frequency was significantly lower during the three voluntary stuttering conditions which included bouncing on 5%, 10%, and 15% of syllables read. However, speech effort was significantly lower during two of the three voluntary stuttering conditions than the control condition (Davidow et al., 2019).

A study was done by Davidow & Ingham (2013) to check the effect of speech rate on stuttering frequency, phonated intervals, speech effort, and speech naturalness during chorus reading. Eight participants who stuttered were considered for the study. They were asked to read high school textbook passage during control reading conditions and during several chorus reading conditions produced at

different speech rates. They reported that increasing speech rate might result in less natural-sounding speech as rated by listeners and slower chorus conditions were less effortful as rated by speaker, suggesting that reducing the rate of the accompanist can provide PWS with a more appropriate reference for how physically effortful normally fluent speech production should be.

2.2 Speech effort and fluency inducing techniques

True fluency is defined as producing natural-sounding speech at an appropriate rate while exerting acceptable physical and mental effort (Kalinowski & Dayalu, 2002). Fluency-inducing strategies will result in immediate, natural-sounding, effortless, and fluent speech.

Few fluency-inducing approaches include the following: **Choral Speech** is a condition in which two or more persons read the same content loudly in unison. The person who stutters speaks in synchronization with another speaker who speaks before them, resulting in **shadow speech.** In **Frequency Altered Feedback (FAF),** the speaker hears an electronically altered reproduction of his or her own voice in addition to the original. In **Delayed Auditory Feedback (DAF),** the speaker hears his or her voice following a short delay (i.e., 50ms). These techniques reduce the stuttering frequency and induce true fluency.

Second speech signals, which include choral, shadow, frequency altered feedback, delayed auditory feedback, and congruent visual gestures of ongoing speech, have been found to be a more effective tool in the induction of immediate, natural-sounding, effortless, and fluent speech in the stuttering population that resembles true fluency. Unlike traditional therapeutic methods, the second speech

signal is simple to duplicate and can generate fluent speech without the use of cognitive mediation. (Kalinowski & Dayalu, 2002).

2.3 Speech subsystems and stuttering

Speech production is a complex motor activity in which the respiratory, phonatory, and articulatory systems work together in a highly coordinated manner. Speech disorders, such as stuttering, can result from a lack of coordination between any of these subsystems. The respiratory system provides the necessary energy and pressure for speech production. Inspiration and expiration are the two phases of respiration; speech is produced during the expiratory phase. Breathing patterns are also important in speech production. The chest muscles contract the laryngeal muscles during thoracic breathing, causing the person to stutter. As the person tries to overcome these challenges, the effort required to speak will increase.

On a minimal movement task, adults with stuttering made considerably larger movements of the jaw, tongue, or lower lip than normal speakers, indicating that adults with stuttering had a reduced perceptual resolution for detecting changes in oral position (DeNil & Abbs, 1991). In a jaw movement accuracy task, an adult with stuttering showed significantly higher movement error and variability. When there is in coordination between subsystems, it affects the person's speech in several ways, including increased neck tension, stiffness, and jerkiness in the articulators such as the jaw, lip, and tongue. As a result, they will exert more physical effort while speaking.

Several studies have been attempted to see the relationship between stuttering and subsystems comparison of jaw-phonatory coordination between adults with stuttering and adults with normal speech fluency. Loucks et al. (2006) reported that

total variability and variable errors values were high for AWS than the controlled, indicating the control participants produced accurate movements.

Perkins et al. (1976) in their study asked 30 persons with stuttering read three 130-131 syllable excerpts from the "Rainbow Passage" under three different conditions, i.e., voiced, lipped, and whispered. Disfluencies were progressively reduced as the complexity of phonatory and respiratory coordination was simplified. Twenty-seven of thirty subjects showed a reduction of stuttering from the voiced to whispered condition. All thirty subjects, without exception, showed a further reduction from whispering to silent articulation. Increased speaking rates in the presence of reduced stuttering appeared to be evidence that simplification of phonatory and respiratory changes facilitates the effective rhythmical flow of speech.

Few authors compared the perception of physical tension by the speaker and the observer during a speech task. In a study done by Tichenor et al. (2018) audio-video recordings of spontaneous speech and reading samples were taken from 10 participants who stutter, and both clinician and participants rated physical tension using SSI 4. They found trained clinicians demonstrated a high degree of reliability while judging fluency counts, and there was a lower agreement when they judged the duration of disfluencies and physical concomitant subsection of the SSI-4. Authors reported that people who stutter reported more physical tension in terms of location and degree than clinicians could observe. They also emphasized the use of speaker self-reports to assess physical tension during stuttering

2.4 Stuttering and situational/ individual specificity:

Researchers studied communication apprehension and self-perceived communication competence in adolescents who stutter. Thirty-nine adolescents who stutter (experimental group) and thirty-nine adolescents who do not stutter (controlled group) were taken for the study. Results revealed that adolescents who stutter reported higher communication apprehension in meetings, group discussions, and interpersonal conversation than controlled group subjects, and adolescents who stutter perceived themselves as having poor communication competence than the other group (Blood et al., 2001).

Werle and Byrd (2021) studied whether adults who stutter have a more negative perception in college classrooms and how stuttering affected them while approaching professors. Results revealed that adults who stutter reported that they experienced more negative perceptions from their professors than adults who do not stutter and do not feel much comfortable approaching their professors.

2.5 Stuttering and emotional state

People who stutter may experience avoidance, struggle, anxiety, and embarrassment, as well as fears of social harm, negative evaluation, social isolation, self-consciousness, and low self-esteem (Riley et al., 2004; Cream et al., 2003; Ginsberg, 2000; Messenger et al., 2004). These may contribute to the increase in mental effort while speaking.

In their study, Craig and Hancock (1995) found that 40% of the 109 participants who stuttered and relapsed reported they relapsed after successful

stuttering therapy and attributed it to their embarrassment at using fluency-improving techniques.

2.6 Stuttering and quality of life:

Klein and Hood (2004) did a survey study to check the impact of stuttering on employment opportunities and job performance in PWS. A total of 232 participants answered the questionnaire, and it was found that stuttering negatively impacted their employment. Results revealed that 70% of participants believed that stuttering decreased the chances of being hired and interfered with promotion possibilities, and 69% of participants reported that stuttering hindered job performance

2.7 Stuttering and self-perception:

Hogan (2017) conducted a study to investigate the relationship between self-compassion, self-perception, and stuttering severity in adults who stutter. Self-report questionnaires were filled out by four participants independently. Results of this study revealed a negative relationship between the severity of stuttering and self-compassion. No relationship was found between stuttering severity and self-perception.

2.8 Importance of self-report in stuttering rehabilitation:

Clinicians primarily focus on minimizing speech disfluencies and observable overt behaviors when providing stuttering rehabilitation. However, in stuttering remediation, it is also necessary to pay close attention to covert behaviors like anxiety, fear, emotions, and speech effort.

Any stuttering treatment plan should aim to produce instant, spontaneous, effortless, and natural-sounding speech that is indistinguishable from that of non-

stutterers (Dayalu & Kalinowski 2001, Kalinowski & Dayalu, 2002). The person with stuttering may be frustrated by the effort and vigilance required to maintain an artificial pattern while employing therapy techniques, even though the techniques result in a monotone that drastically reduces the stuttering frequency. Alternatively, even if the count is reported higher by the listener, the PWS might relax his suppressive vigilance to feel much free and open. This idea emphasizes the importance of 'ease of effort' in stuttering treatment protocols for generating fluent speech.

Self-reporting questionnaires can help identify covert features of the disorder that make up most of the pathology, even when people who stutter appear to be quite fluent. It is possible to evaluate the client's performance several times using a self-reporting questionnaire because they are simple to administer and can provide a wealth of information about the therapeutic protocol's effectiveness. It also allows people who stutter to express their perspectives/ viewpoints on the stuttering condition (Kainowski et al., 2004).

Self-report data were reviewed in the assessment of stuttering therapy efficacy by Guntupalli et al. (2006). They reported that just by counting the visual/ audible portion of the stuttered speech, efficacy measures fail to capture information regarding the covert behaviors, such as sense of loss of control, unnatural sounding speech, decreased ease of speech production, and increased speech effort. Therefore, authors opined that conventional fluency therapy techniques would help in reducing overt features of stuttering disorder but cannot produce true fluency that resembles the effortless, natural speech like the person who does not stutter.

In a study done by Brian et al. (2003), a sustained speech therapy program was provided for adults with stuttering where both objective and self-report data were gathered. Participants were provided subjective ratings of the various parameters related to fluency before and after therapy on a nine-point scale. Positive ratings were on the lower end of the scale, while negative ratings were on the higher end. According to the findings, 80% of the participants scored four or higher in terms of discomfort, and 60% rated five or higher in terms of discomfort using prolonged speech outside of the clinic. Despite spending months in a therapy program, the majority of participants lacked a sense of comfort and ease when using prolonged speech in social settings outside of the clinic.

CHAPTER 3

Method

The study focused on exploring the self-rated and clinician-rated parameters of speech effort in stuttering. The study included 4 phases:

Phase 1: Development of self-rated and clinician-rated questionnaires

Phase 2: Validation of the questionnaires

Phase 3: Administration of the questionnaires

Phase 4: Statistical analysis of the data

Phase 1: Development of self-rated and clinician-rated questionnaires:

Self-rated parameters of speech effort in stuttering

The self-rated questionnaire consisted of questions that probed into an individual's perception about his/her problem, experience with therapy, and general attitudes towards speaking. Both open-ended and close-ended questions were given in the questionnaire. A rating scale was developed to assess speech effort across several factors.

Self-rated parameters of speech effort in stuttering consisted of 5 sections.

1. Effort based on subsystems.
2. Effort based on situations.
3. Effort based on individuals.
4. Effort in relation to emotional state- included open-ended questions.
5. Viewpoints on stuttering therapy.

Sections 1, 2, and 3 consisted of 4-point rating scales with 0 to 4, suggesting

0-   No difficulty

1-   Little difficult

2-   Quite difficult

3-   Very difficult

Speech effort in relation to the emotional state- consisted of self-rated and open-ended questions as well. The rating of 0 to 3 as indicated below was used.

0-   Not at all

1-   A little

2-   A lot

3-   Always

Questions about stuttering therapy techniques were probed (from the client) using polar questions, and 4-point rating scale is indicated below.

0-   Not at all

1-   A little

2-   A lot

3-   Always

The client's viewpoints about successful stuttering therapy were investigated using 3-point rating scale, given as follows.

1-   No

2-   Somewhat

3-   Yes

Clinician rated parameters of speech effort in stuttering

This questionnaire was rated by the respective clinician (who had taken ten sessions of therapy for the client). It consisted of 5 sections.

1.   Open-ended questions

2.   Effort based on subsystems

3.   Effort based on situation

4.   Effort based on individuals

5.   Clinician's viewpoint about successful stuttering therapy

The open-ended questions probed into the clinician's knowledge about the speech effort during stuttering and while using the speech therapy techniques. The sections on the effort based on subsystems, effort based on situation, and effort based on individuals consisted of 4 point rating scale, as indicated below.

0-   No difficulty

1-   Mild difficulty

2-   Moderate difficulty

3-   Severe difficulty

Clinician's viewpoint about successful stuttering therapy was rated using 3-point rating scale as given below.

1- No improvement

2- Somewhat improvement

3- Good improvement

Phase 2: Validation of questionnaire

The self-rated and clinician-rated parameters of speech effort in stuttering were given to three speech and language pathologists to validate the content, and suitable modifications were done before circulating the respective questionnaires to PWS and the clinicians.

Phase 3: Administration of the questionnaire

Data collection included the following steps:-

Recruitment of participants

- A total of 15 participants were recruited for the study.

- Participants in the age range of 15-55 years and diagnosed with stuttering during evaluation (SSI-4) were considered.

- Both males and females participated in the study.

- Participants with stuttering severity ranging from very mild to very severe were included.

- Participants who attended at least 10 sessions of therapy were considered.

- As data was gathered via online mode, only those who had access to the internet were considered.

- Participants diagnosed with other neurological conditions such as dysarthria and aphasia were excluded.

Table 3.1

Details of participants

Sl. No	SSI 4 scores	Age/ Gender	Severity of stuttering
1.	33	23 years	Severe
2.	28	27 years	Moderate
3.	55	29 years	Moderately severe
4.	22	21 years	Mild
5.	32	23 years	Severe
6.	24	20 years	Mild
7.	32	24 years	Severe
8.	25	23 years	Moderate
9.	16	20 years	Very mild
10.	24	29 years	Mild
11.	20	30 years	Mild
12.	17	44 years	Very mild
13.	37	20 years	Very severe
14.	26	21 years	Moderate
15.	15	24 years	Very mild

The following ethical standards were followed during the study

- Participants in the study were verbally informed about the goals of the study, procedure, and estimated duration to complete the questionnaire.

- An e- copy of informal consent was taken from the persons with stuttering.

Procedure

Data collection was carried out through online platforms such as (Google meet, Zoom or WhatsApp video call). A one-hour session was taken by the examiner to rate the different parameters of speech effort in PWS. Initially, the examiner provided clear instructions to the participants regarding the self-rated scale, and they were asked to rate the questionnaire. Both the clinician (who had taken at least 10 sessions) and the examiner rated the speech effort in the participants during spontaneous speech, reading, and conversation tasks.

Phase 4: Statistical analysis of the data

The data was subjected to suitable statistical analysis to arrive at results using SPSS- Statistical Package for Social Sciences Version 21.0 (IBM Corp., Armonk, NY, USA).

CHAPTER 4

Results

The present study aims to develop a self-rated and clinician-rated questionnaire to study the overt and covert behaviors in relation to speech effort in Persons with stuttering and compare ratings given by the person with stuttering with the rating given by the clinician and the examiner (investigator of the study).

A total of 15 participants were taken for the study, whose stuttering severity varied from very mild to very severe degree. All the participants had attended at least ten therapy sessions before answering the questionnaire. Participants' responses were correlated with 15 clinician responses (who provided at least ten therapy sessions to the respective participants), and the clinician responses were also correlated with those of the examiner. The questionnaire administration procedure is described in detail in the method section of Chapter 3.

Data was collected, tabulated, and subjected to statistical analysis using Statistical Package for the Social Sciences (SPSS) software (Version 21.0). Following statistical analysis was carried out.

Spearman correlation was used to check the correlation among three groups (correlation between clinician and examiner, correlation between clinician and participant, and correlation between participants and the examiner).

Spearman correlation was used to check the correlation between stuttering severity and speech effort in different domains such as speech effort based on subsystems, in different situations, in different emotional states, and speech effort in relation to stuttering therapy.

Descriptive analysis was done for open-ended questions and for the questions addressed to only the participant group.

The results are discussed under the following headings:

a)   Correlation of effort based on subsystems.

b)   Correlation of effort based on situations.

c)   Correlation of effort based on individual specificity.

d)   Speech effort in relation to stuttering therapy.

e)   Speech effort in relation to the emotional state (rated by the participants).

f)   Open-ended questions in the self-rated questionnaire.

g)   Open-ended questions in the clinician-rated questionnaire.

h)   Correlation between severity and the above domains.

4.1 Correlation of effort based on subsystems

The correlation and p values for speech effort relation the respiratory subsystem across clinician, examiner, and participant are shown in Table 4.1

Table 4.1

Correlation of effort in the respiratory system.

Variables	C &E		C & P		P &E	
	Correlation Coefficient	Sig. p value	Correlation Coefficient	Sig. p value	Correlation Coefficient	Sig. p value
R1	**.832**	**.000**	.190	.498	.264	.343
R2	**.603**	**.017**	.123	.663	.090	.750
R0	**.650**	**.009**	.371	.173	**.649**	**.009**

*R1= Respiration question 1, *R2= Respiration question 2, *R0 = Overall effort in respiration *C= Clinician, *E= Examiner, *P= Participant.

From the Table 4.1, it is observed that there was a significant correlation between clinician and examiner rating (p = .000), (p = .017), (p = .009) for variables R1, R2 and R0 respectively. There was a significant correlation between participant and examiner rating (p= .009) for the R0 variable.

The correlation and p values for speech effort relation the phonatory subsystem across clinician, examiner, and participant are shown in Table 4.2

Table 4.2

Correlation of effort in the phonatory system.

Variables	C & E		C & P		P & E	
	Correlation Coefficient	**Sig. p value**	**Correlation Coefficient**	**Sig. p value**	**Correlation Coefficient**	**Sig. p value**
P1	**.656**	**.008**	.342	.213	.498	.059
P2	**.631**	**.012**	.035	.901	.453	.090
P0	.402	.138	.166	.555	**.788**	**.000**

*P1= Phonation question 1, *P2= Phonation question 2 , *P0= Overall effort in phonation *C= Clinician, *E= Examiner, *P= Participant.

From Table 4.2, it is was found that there was a significant correlation between clinician and examiner rating (p = .008), (p = .012) for P1 and P2 variables, respectively. There was a significant correlation between participant and examiner rating (p= .000) for P0 variable.

The correlation and p values for speech effort relation the articulatory subsystem across clinician, examiner, and participant are shown in Table 4.3.

Table 4.3

Correlation of effort in the articulatory system.

Variables	C & E		C & P		P & E	
	Correlation Coefficient	Sig. p value	Correlation Coefficient	Sig. p value	Correlation Coefficient	Sig. p value
A1	**.631**	**.012**	-.086	.760	-.057	.841
A2	**.752**	**.001**	.170	.544	.344	.209
A0	**.805**	**.000**	.294	.287	**.605**	**.017**

*A1= Articulation question 1, *A2= Articulation question 2 , *Articulation= Overall effort in articulation *C= Clinician, *E= Examiner, *P= Participant.

From Table 4.3, it is observed that there was a significant correlation between clinician and examiner rating (p =.012), (p = .001), (p= .000) for all the three questions related to the articulation subsystem. There was a significant correlation between participant and examiner rating (p= .017) for A0 variable.

4.2 Correlation of effort based on situations

The correlation and p values for speech effort based on situations across clinician, examiner, and participant are shown in Table 4.4

Table 4.4

Correlation of effort based on situations.

Variables	C & E		C & P		P & E	
	Correlation Coefficient	Sig. p value	Correlation Coefficient	Sig. p value	Correlation Coefficient	Sig. p value
Situation 1	.454	.090	.324	.239	**.651**	**.009**

Table 4.4 *continued*

Situation 2	.316	.251	.002	.994	.274	.323
Situation 3	**.621**	**.013**	.244	.381	.327	.234
Situation 4	**.748**	**.001**	.368	.177	.407	.132
Situation 5	**.570**	**.026**	.035	.902	-.015	.957

*Situation= Questions based on situation, *C= Clinician, *E= Examiner, *P= Participant,

*Situation 1=Answering phone/ Making phone calls, *Situation 2=Reading non familiar material, *Situation 3= Reading with repeated practice, *Situation 4=Introducing self, *Situation 5= Speaking within stipulated time

From Table 4.4, it is observed that there was a significant correlation between clinician and examiner rating (p= .013), (p = .001), (p = .026) for Situation 3, Situation 4 and Situation 5 respectively. There was a significant correlation between participant and examiner rating (p= .009) for Situation 1.

Additional questions were given in the self-rated questionnaire. For Situation 6 related to speaking in front of a large group, 20% (3 participants) reported mild difficulty, 46.7% (7 participants) reported moderate difficulty, and 33.3% (5 participants) reported severe difficulty. For Situation 7 that checked for difficulty in answering questions giving attendance, 20% (3 participants) of participants reported no difficulty, 40% (6 participants)of participants reported mild difficulty, 20% (3 participants) participants reported moderate difficulty, and 20% (3 participants) of participants reported severe difficulty.

4.3 Correlation of effort based on individual specificity

The correlation and p values for speech effort based on individual specificity across clinician, examiner, and participant are shown in Table 4.5

Table 4.5

Correlation of effort based on individual specificity.

Variables	C & E		C & P		P & E	
	Correlation Coefficient	Sig. p value	Correlation Coefficient	Sig. p value	Correlation Coefficient	Sig. p value
Individual 1	.457	.087	.355	.194	**.732**	**.002**
Individual 2	**.779**	**.001**	**.749**	**.001**	**.623**	**.013**
Individual 3	**.797**	**.000**	.283	.306	.344	.209

*Individual = Questions based on Individual specificity, *C= Clinician, *E= Examiner, *P= Participants*

*Individual 1= parents, *Individual 2=Colleagues/ classmates/ friends, *Individual 3=Strangers

From Table 4.5, it is observed that there was a significant correlation across clinician, investigator, and participant rating (p = .001), (p=.001), (p= .013), for the effort involved while speaking to Individual 2. There was a significant correlation between clinician and examiner rating (p=.000) and between participant and examiner rating for speech effort involving Individuals 3, and 1 respectively.

Additional questions were given in the self-rated questionnaire. It was found that for the question related to speaking with relatives (Individua 4), 40% (6 participants) reported no difficulty, 33.3% (5 participants) reported mild difficulty, 20% (3 participants) reported moderate difficulty, and 6.7 % (1 participant) reported severe difficulty while speaking with relatives.

For question 5 related to speaking with superiors or higher authorities (Individual 5), 6.7% (1 participant) reported no difficulty, 53.3% (8 participants) reported mild difficulty, 20% (3 participants) reported moderate difficulty, and 20% (3 participants) reported severe difficulty while speaking with higher authorities. For question 6 related to speaking with children (Individual 6), 60% (9 participants) reported they do not have any difficulty, 26.7% (4 participants) reported they face mild difficulty, and 13.3% (2 participants) reported they face moderate difficulty while speaking with children.

4.4 speech effort in relation to stuttering therapy

4.41 Questions related to stuttering therapy techniques

When the participants were asked if they feel comfortable using therapy techniques, they all reported that they are comfortable using the therapy techniques while speaking. When the participants were asked to rate their speech effort while using the therapy techniques, 13.3% (2 participants) reported that their speech was not at all effortful, 73.3%(11 participants) said little effortful, and 13.3%(2 participants) said they experienced a lot of effort while speaking using therapy techniques.

4.42 Correlation of participants' and clinicians' viewpoints about successful stuttering therapy

The correlation and p values for viewpoints on successful stuttering therapy between participants and clinicians are shown in Table 4.6

Table 4.6

Correlation of participants' and clinicians' viewpoints about successful stuttering therapy.

Variables	P&C	
	Correlation Coefficient	**Sig.** **p value**
VP 1	-.055	.847
VP 2	.124	.659
VP 3	-.131	.643
VP 4	**.607**	**.016**
VP 5	-.157	.576
VP 6	-.363	.184
VP 7	.182	.517

* VP= Post therapy viewpoint related to successful stuttering therapy, *C= Clinician, *P= Participant.

*VP1= Enhanced speech fluency, *VP2= Natural sounding speech, *VP3= Reduced effort while speaking, *VP4= Independent use of therapy techniques, *VP5= Reduced avoidance and anticipatory behavior, *VP6= Self- confidence, *VP7= Increased knowledge and understanding of fluency and stuttering.

From Table 4.6, it is observed that there was a significant correlation between clinicians' and participants' ratings (p = .016) for the viewpoint based on question 4.

Additional questions were given in the self-rated questionnaire. In question 8 related to stuttering therapy, participants were asked whether they were satisfied with the therapy program. 26.7% (4 participants) said they were somewhat satisfied, and 73.3 %(11 participants)said they were satisfied. For question 9, where the participants were asked if the stuttering therapy met their goals, 60% (9 participants) reported that the therapy somewhat met their goals, and 40 % (6 participants)

reported that therapy completely met their goals. For question 10 that checked if PWS feels comfortable while speaking after therapy, 6.7% (1 participant) said they are not comfortable, 53.3% (8 participants) said they are somewhat comfortable, and40% (6 participants) said they are comfortable.

For question 11whereparticipants were asked if they feel anxious about their speech while using the therapy techniques, it was observed that 46.6% (7 participants) reported that they were not anxious, 40% (6 participants) reported they are somewhat anxious, and 13.3% (2 participants) reported that they were definitely anxious. In question 12, participants were questioned whether they still anticipate/avoid stuttering even after therapy. It was observed that 26.6% (4 participants) of participants reported that they do not anticipate/ avoid stuttering, 60% (9 participants) reported they somewhat anticipate/ avoid stuttering, and 13.3% (2 participants) reported that they definitely anticipate/ avoid stuttering.

One additional question was given in the clinician-rated questionnaire where the clinicians were asked if the stuttering severity was reduced in PWS after attending therapy. For this, 40% (6 participants) of the clinicians responded that stuttering severity was somewhat reduced, and 60% (9 participants) of the clinicians responded that stuttering severity was significantly reduced.

4.5 Speech effort in relation to the emotional state (rated by the participants)

The results of speech effort in relation to emotional states (rated by the participants) are given in Table 4.7.

Table 4.7

Speech effort in relation to the emotional state (rated by the participants)

SL. No	Variables	Not At All	A Little	A Lot	Always
1	Effort when they Anticipate stuttering.	0	53.3%	46.7%	0
2	Sad/ Disappointed after a stuttering episode.	6.7%	40%	46.7%	6.7%
3 A)	Effortful when (Happy).	46.7%	26.7%	26.7%	0
3 B)	Effortful when (Sad).	33.3%	46.7%	13.3%	6.7%
3 C)	Effortful when (Excited).	6.7%	33.3%	40%	20%
4	Scared before Speaking.	13.3%	53.3%	26.7%	6.7%
5 A)	Emotions after a stuttering Episode (Embarrassment)	6.7%	53.3%	33.3%	6.7%
5 B)	Emotions after a Stuttering Episode (Disappointment)	6.7%	40%	46.7%	6.7%
5 C)	Emotions after a Stuttering Episode (Anger)	46.7%	26.7%	20%	6.7%

From table 4.7, it is found that 53.3 % (8 participants) had little effort, and

46.7% (7 participants) had a lot of effort when they anticipated stuttering. When

they stuttered, 40 % (6 participants) reported little, and 46.7% (7 participants)

indicated a lot of sadness/disappointment. When participants were happy, 46.7 % (7

participants) rated that they experienced no speech effort, 26.7% (4 participants) experienced little speech effort, and 26.7% (4 participants) experienced a lot of effort. When they were sad, 33.3% (5 participants) said they had no speech effort, 46.7% (7 participants) said they had little effort, 13.3% (2 participants) said they had a lot of effort, and 6.7% (1 participant) said that always experienced effort while speaking.

When they were excited, 6.7% (1 participant) said they had no effort, 33.3% (5 participants) said they had a little effort, 40% (6 participants) said they had a lot of effort, and 20% (3 participants) said that they always had effort while speaking. When asked if they were scared before speaking, 13.3% (2 participants) reported they were not at all scared, 53.3% (8 participants) reported they were a little scared, 26.7% (4 participants) reported they were scared a lot, and 6.7% (1 participant) said they were always scared.

When the participants were asked to rate their feelings (like embarrassment, disappointment, and anger) after stuttering, it was observed that 6.7% (1 participant) were not at all embarrassed, 53.3% (8 participants) were little embarrassed, 33.3% (5 participants) were embarrassed a lot, and 6.7% (1 participant) were always embarrassed after a stuttering episode. Likewise, 6.7% (1 participant) expressed no disappointment, 40% (6 participants) a little disappointment, 46.7% (7 participants) a lot of disappointment, and 6.7% (1 participant) always felt disappointed after stuttering.

When the participants were asked to rate their anger after a stuttering episode, 46.7% (7 participants) reported they do not experience anger at all, 26.7% (4 participants) reported they feel a little angry, 20% (3 participants) reported a lot of

anger, and 6.7% (1 participant) reported they feel angry always after a stuttering episode.

4.6 Open-ended questions in the self-rated questionnaire

Open-ended questions regarding reaction to stuttering and quality of life were probed. The participants' responses were not limited to a single word; they were free to convey as many feelings or responses as they wanted. The results of participants' perceptions about themselves after stuttering are shown in Figure 4.1

Figure 4.1

*Participants' perceptions about themselves after stuttering.*
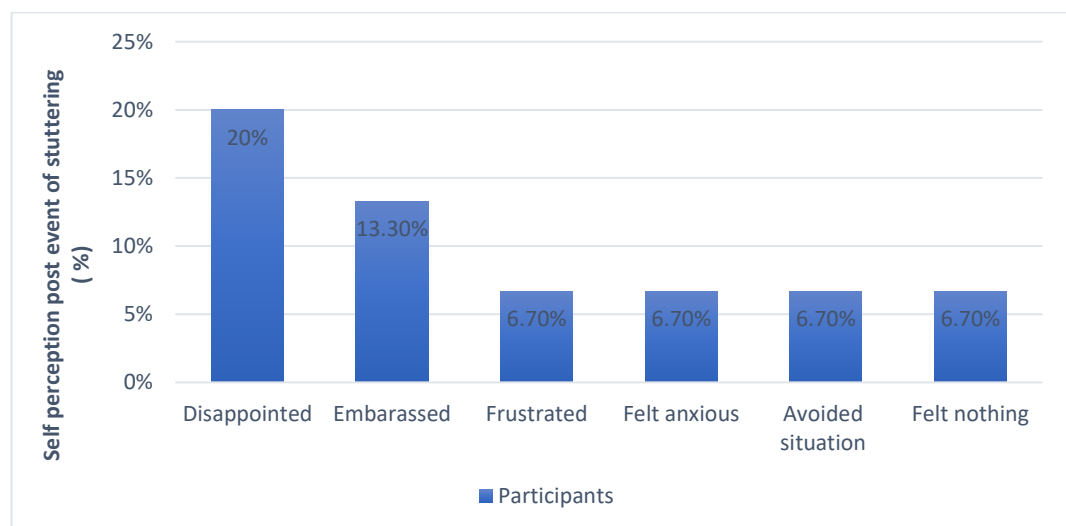
From Figure 4.1, it is found that 20% (3 participants) were disappointed and felt sad, 13.3% (2 participants) were embarrassed, tried to practice the techniques more, and tried to accept, 6.7% (1 participant) was frustrated, felt anxious, avoided situations, and6.7% (1 participant) felt nothing.

The results of participants' perception of others' feelings towards their stuttering are shown in Figure 4.2

Figure 4.2

*Participants' perception of others' feelings towards their stuttering*
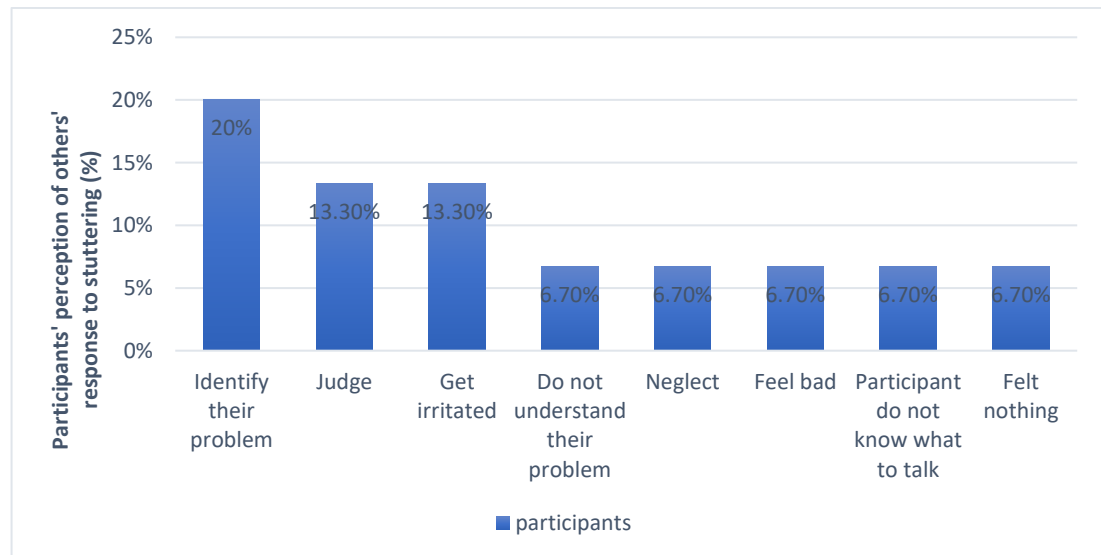
From Figure 4.2, It is found that 20% (3 participants) felt that others might identify their problem. 13.3% (2 participants) felt that others might judge and might get irritated. 6.7% (1 participant) reported that others do not understand their problem, may neglect them. Others' feel bad (show compassion), think that participants do not know what to talk and 6.7% (1 participant) reported that they feel nothing about others' perception of their stuttering.

The results of the impact of stuttering on participants' quality of life are shown in Figure 4.3.
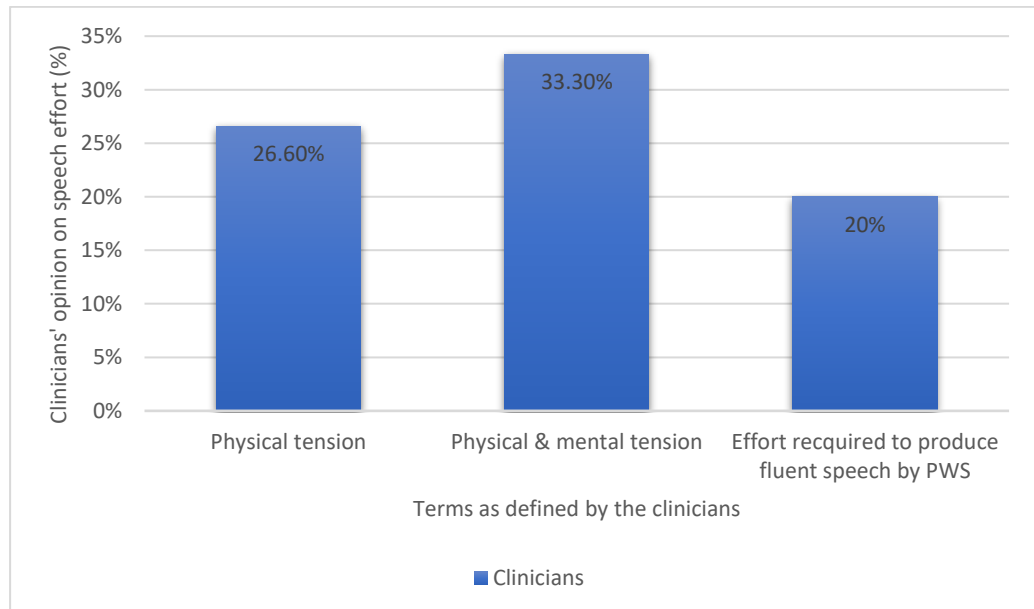
Figure 4.3

Impact of stuttering on participants' quality of life
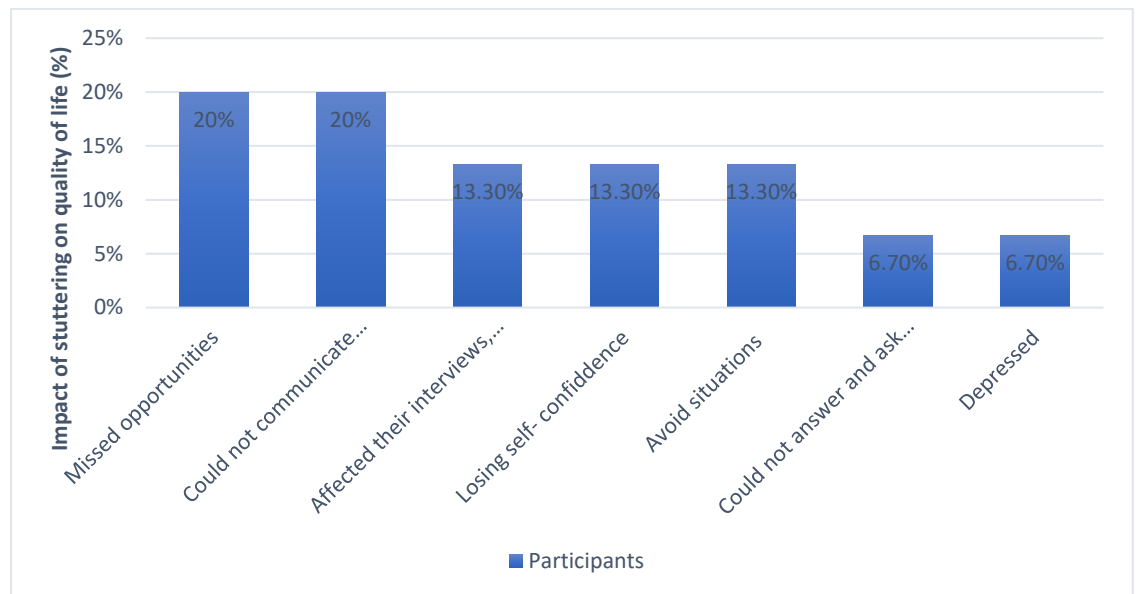
From Figure 4.3, it is observed that 20% (3 participants) of them reported that they missed opportunities and could not communicate with others effectively. 13.3% (2 participants) reported that stuttering affected their interviews, presentation, and viva: some reported stuttering led to losing their self-confidence and also made them avoid some situations (like attending phone calls and speaking in public). 6.7% (1 participant) reported they could not answer and ask questions in the classroom, and 6.7% (1 participant) said they were depressed.

4.7 Open-ended questions in the clinician-rated questionnaire

The clinicians' responses were not restricted to a single word; they were free to convey as responses as they wanted. The results of Clinicians' opinions on speech effort are shown in Figure 4.4

Figure 4.4

Clinicians' opinions on speech effort

From Figure 4.4, it is observed that 26.6% (4 clinicians) said the physical tension experienced by a person with stuttering while speaking. 33.3% (5 clinicians) said both physical and mental effort experienced while speaking, and 20% (3 clinicians) said speech effort is something that required producing fluent and intelligible speech.

The results of subsystems that need to be worked upon in stuttering therapy are shown in Figure 4.5

Figure 4.5

Subsystem needs to be worked upon in stuttering therapy
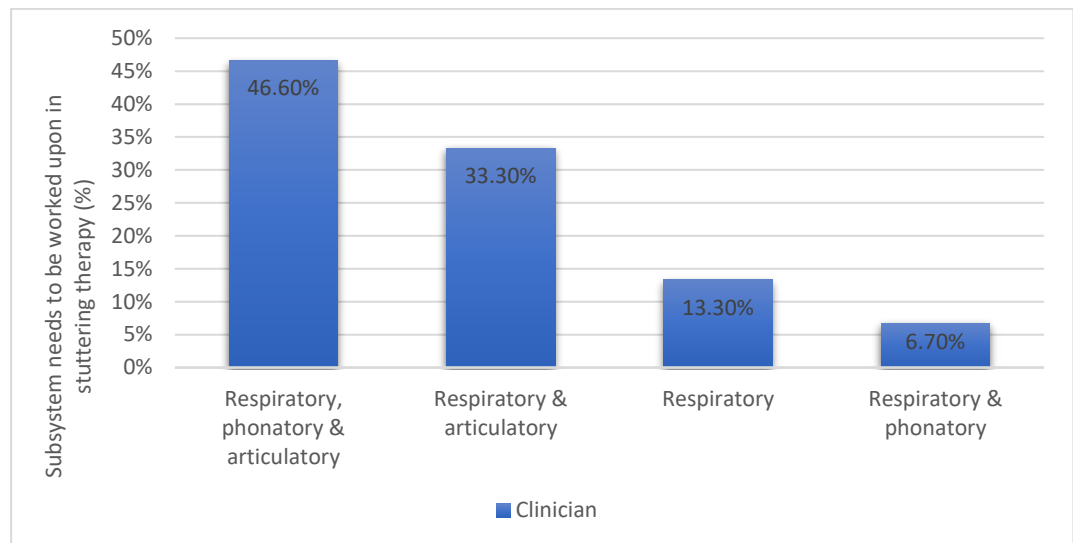
From Figure 4.5, it is observed that 46.6% (7 clinicians) reported they considered respiratory, phonatory, and articulatory systems. 33.3% (5 clinicians) reported they considered respiratory and articulatory systems, 13.3% (2 clinicians) reported they considered only the respiratory system, and 6.7% (1 clinician) reported they considered respiratory and phonatory systems while providing therapy for PWS.

The results of clinicians' opinions on measuring speech effort are shown in Figure 4.6

Figure 4.6

Clinicians' opinions on measuring speech effort
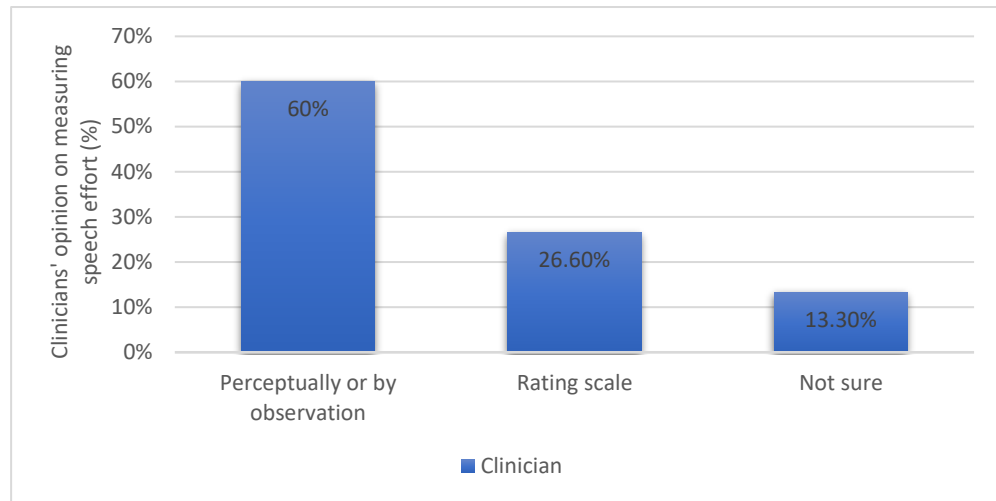
From Figure 4.6, It is found that 60% (9 clinicians) said they would measure perceptually or by observation using conversation, reading, and counting numbers tasks. 26.6% (4 clinicians) said speech effort could be measured using a rating scale, 13.3 (2 clinicians) said they are unsure how to measure it.

The results of goals considered by the clinicians while planning for stuttering therapy are shown in Figure 4.7

Figure 4.7

Goals considered by the clinicians while planning for stuttering therapy
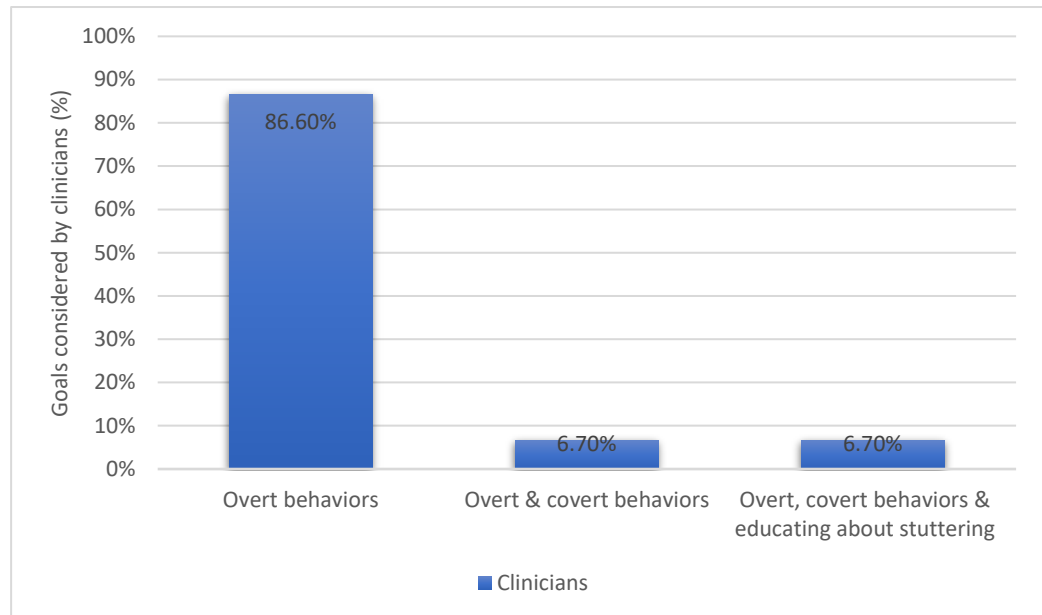
From Figure 4.7, it is observed that 86.6% (13 clinicians) said they focus on overt behaviors. 6.7% (1 clinician) said they focus on both overt and covert behaviors. 6.7% (1 clinician) said along with overt and covert behaviors educating the client about stuttering is also important.

The results of clinicians' viewpoints about successful stuttering therapy are shown in Figure 4.8

Figure 4.8

Clinicians' viewpoints about successful stuttering therapy

From Figure 4.8, It is observed that 13.3% (2 clinicians) reported production of effortless speech, 53.3% (8 clinicians) reported generaliza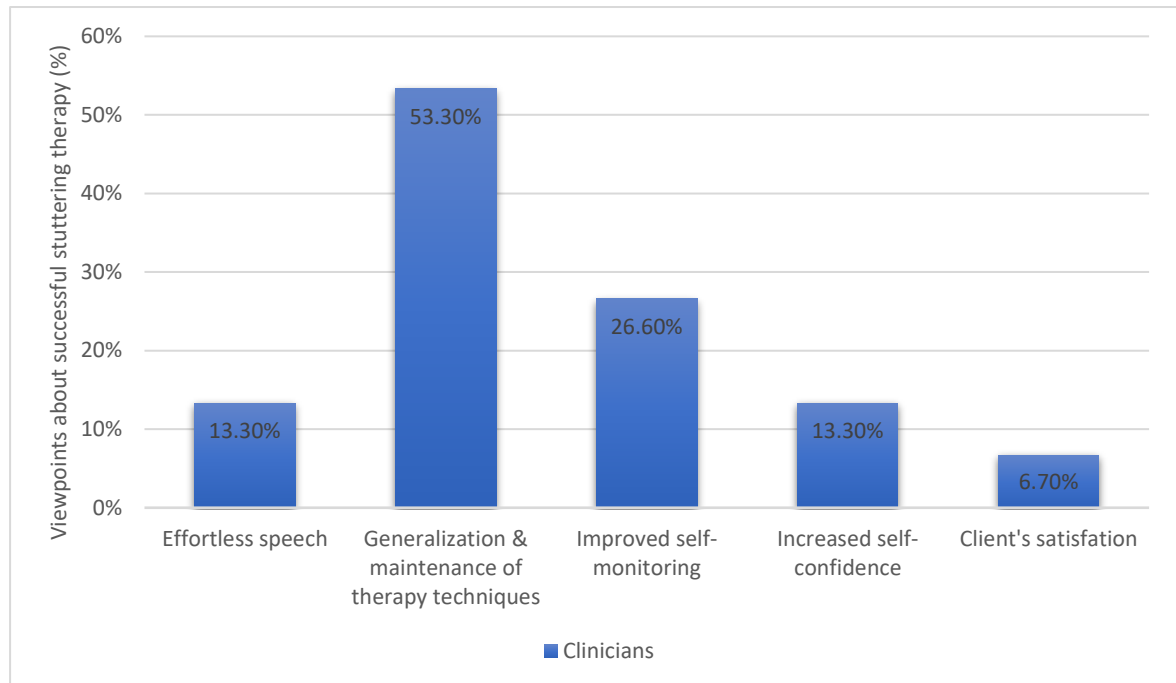tion and maintenance of therapy techniques in all situations, 26.6% (4 clinicians) reported improved self-monitoring, 13.3% (2 clinicians) reported increased self-confidence and 6.7% (1 clinician) reported that stuttering therapy said to be successful when the client is satisfied with the therapy program.

4.8 Correlation between severity and the above domains

Spearman correlation was used to check the correlation between stuttering severity and speech effort in different domains such as speech effort based on subsystems, in different situations, in different emotional states, and speech effort in relation to stuttering therapy. It was found that there was no correlation between stuttering severity and other factors like speech effort based on subsystems, speech

effort in different situations, with different individuals, and in different emotional

states of the participants.

CHAPTER 5

Discussion

The present study focused on examining speech effort in PWS. An attempt was made to compare the results between the clinician and the examiner, clinician and participants, participants and the examiner.

5.1 Correlation of speech effort based on subsystems

According to the results obtained, there was a good correlation between clinicians' and examiner responses, but there was no significant correlation between clinicians' and participants' responses and examiner and participants' responses for questions on respiratory, phonatory, and articulatory subsystems. This result is in consensus with the study done by Tichenor et al. (2018), where the degree of the tension reported by the PWS was higher than the clinicians could observe; they also emphasized the use of speaker self-reports to assess physical tension during stuttering. This may be because the clinician and the examiner can observe only overt/ visible features, and they may not perceive covert difficulties and tension faced by the PWS.

5.2 Correlation of effort based on situations

Results of speech effort in different situations revealed that there was no correlation between participants' and clinicians' responses. This could be because the clinician can only create the various speaking situations within the therapy setting and may not be able to actually assess the client talking in his real-life scenarios (outside therapy settings). Participants also reported varying levels of speech effort while answering attendance. This may be due to anticipation of stuttering before answering attendance. The majority of participants had moderate to

severe speech effort while speaking in front of a large group, a finding similar to that of a study done by Blood et al. (2001). The results are also similar to that of a study done by Diehl et al. (2019) where PWS had significant anxiety with speaking on the telephone and in front of large group.

5.3 Correlation of speech effort based on individual specificity

It was found that there was a significant correlation between participants' and the clinicians' responses for one question related to speaking with colleagues/ classmates/ friends, but there was no significant correlation between them for questions related to speaking with parents and strangers. This could be because speaking with peers could be less demanding, hence the consensus of the findings between the clinicians' and participants'.

However, client may face varying levels of difficulty while speaking to elders and strangers, which cannot be effectively assessed by the clinicians. Participants also reported less effort while speaking with children but greater effort while speaking with higher authorities. This result is in consensus with the results of the study done by Werle and Byrd (2021) where the PWS reported that they received more negative feedback from their professors and were less likely to approach their instructors.

5.4 Correlation of participants' and clinicians' viewpoint about successful stuttering therapy

There was a good correlation between clinicians' and participants' responses to the question that checked the independent use of stuttering therapy techniques. This may be because independent usage of therapy techniques can be overtly observed and can be monitored by the clinician. There was no significant correlation

for all other viewpoints, suggesting measuring the success of the stuttering therapy by the participants is not the same as what is measured by the clinician. This result is similar to the results of the study done by Guntupalli et al. (2006) who found that just by counting the visual/ audible portion of the stuttered speech, efficacy measures fail to capture information regarding the covert behaviors, such as sense of loss of control, unnatural sounding speech, decreased ease of speech production and increased speech effort.

From the present study it was found that most of the participants were satisfied with the therapy program, however not all agreed that the therapy completely met their goals. They also reported that they felt very comfortable after therapy, and their anxiety had reduced with the therapy. However, a significant finding was that even after therapy, the majority of the individuals still anticipated and avoided stuttering, which goes to show that it is important to set realistic targets in therapy.

It is essential to educate the client about stuttering and how the different therapy techniques help to modify and reduce their stuttering and may not completely eliminate it. The whole point of therapy should be towards reducing effort in speaking (covert feature) and not only on the reduction of the frequency of stuttering (overt feature), since individuals may still encounter stuttering outside the therapy setting, even after therapy because of which they continue to anticipate or avoid it.

5.5 Speech effort in relation to the emotional state

The results of open-ended questions in the self-rated questionnaire revealed that participants had a varying degree of effort when they anticipated the stuttering episode. Anticipating stuttering may increase anxiety, increasing the speech effort.

This is similar to the results of the study done by Alm (2004) on stuttering, in which reduction in heart rate was reported in the expectation or anticipation of unpleasant stimuli, which is thought to be an indication of anticipatory anxiety resulting in a "freezing response" with parasympathetic inhibition of the heart rate. The participants reported varying levels of effort when they were sad, happy, and excited, suggesting that emotions have a significant role in determining speech effort in stuttering. A study done by Bauerly (2018) reported that under the negative emotional impact, the articulatory stability of adults with stuttering is more vulnerable to breakdown. The results from the present study revealed that the majority of the participants did not feel angry but reported varying levels of embarrassment and disappointment after stuttering. This may be due to PWS having low self-perception about themselves after a stuttering episode. According to the study done by Blood & Blood (2004),adolescents who stutter reported poorer self-perceived communicative competence than the adolescentswho do not stutter.

5.6 Open-ended questions in the self-rated questionnaire

With respect to open-ended questions on perception of self after a stuttering episode, participants reported feelings of disappointment, embarrassment, frustration, and anxiety about their speech after they stutter. As reported in the literature, a study done by Beilby et al. (2013) found that both PWS and his/partner demonstrated feelings of acceptance, anxiety, avoidance, denial, embarrassment, and frustration. In response to others' perception towards their stuttering, the majority of the participants reported that listeners might identify their problem, judge their speech, or get irritated when they stutter.

Participants also reported that stuttering negatively impacted their quality of life, they could not communicate effectively with others, missed opportunities, and performed poorly in interviews. This is similar to the result of the study done by Klein and Hood (2004), in which the PWS reported that stuttering negatively impacted their employment, with stuttering interfering with promotion possibilities, decreasing hiring chances, and hindering job performance. Participants also reported that stuttering affected their viva and presentations, and some said they were not able to answer the questions suitably. A similar findings were reported by O'Brian et al. (2011) who suggested the inverse relationship between stuttering severity and educational attainment.

5.7 Open-ended questions in the clinician-rated questionnaire

Results of open-ended questions in the clinician-rated questionnaire on their understanding of speech effort revealed that some clinicians believe that speech effort is generated solely by physical effort, while others believe that speech effort is caused by both mental and physical effort exerted by the PWS to generate fluent speech. According to a study done by Guntupalli et al. (2006) PWS will have both overt behaviors (physical effort) that are visible and covert behaviors that lead to mental effort, which increases speech effort.

The majority of the clinicians reported they would measure speech effort perceptually or by observation and using a perceptual rating scale, but only one clinician said the self-rating scale could be used to measure speech effort. However, Ingham et al. (2009) have suggested that self-ratings of speech effort are an independent, reliable, and adequately interpretable fluency dimension that can be beneficial in stuttering measurement and therapy. Hence more emphasis needs to be

given to self-rating to aid in the more efficient assessment and management of stuttering.

The majority of the clinicians said they would work upon respiratory, phonatory, and articulatory subsystems during stuttering management. A study done by Peters and Boves (1988) revealed that subglottal pressure built by the PWS significantly differed from the control group and EGG analyses revealed that PWS use an abrupt voice onset significantly more often than the persons who do not stutter. Loucks et al. (2007) in their study, found that a PWS had considerably higher movement error and variability in the jaw movement accuracy task. This suggests the importance of working on the respiratory, phonatory, and articulatory subsystems for efficient management of stuttering.

With respect to the question related to goals to be taken during the stuttering intervention, most clinicians mainly focused on overt features; one clinician reported that that they would focus on both overt and covert features and one more clinician reported that in addition to addressing the overt and covert features they would educate the client regarding their stuttering as well. The questionnaire also enquired about clinician's perspectives on successful stuttering therapy. The results revealed that most clinicians believe stuttering therapy is successful when clients generalize therapy techniques to all situations; however, some clinicians believe stuttering therapy is successful if clients' self-monitoring and self-confidence improve. According to only few clinicians, stuttering therapy is said to be successful when the client's speech is effortless, and he or she is satisfied with the therapy program.

5.8 Correlation between severity and above domains

The present study also revealed that there was no significant correlation between stuttering severity and speech effort in different domains such as speech effort based on subsystems, in different situations, with different individuals, in different emotional states, and speech effort in relation to stuttering therapy. This is in consensus with the study done by Hogan (2017), in which self-reporting questionnaires filled by PWS reported a negative correlation between stuttering severity and self-compassion, and no correlation between stuttering severity and self-perception. This may be because stuttering severity is calculated only based on core and secondary behaviors, whereas other characteristics such as speech effort, self-perception, self–satisfaction, etc., are not considered. Hence for the holistic understanding of stuttering, it is vital to have suitable assessment and management of both overt and covert features of stuttering.

The present study highlights the importance of considering the speech effort in the assessment and management of stuttering. This can be considered as an important factor in determining the success of stuttering therapy.

CHAPTER 6

Summary and Conclusion

When words, phrases, and sentences flow smoothly with little or no effort, speech is considered to be fluent. When a person stutters, he or she may exert effort on various subsystems, which may vary depending on the individual and the situation. Physical and mental efforts are both involved in speech effort, which can be increased during stuttering.

Stuttering severity and post-stuttering therapy efficacy are usually measured only based on core behaviors (repetition, prolongation, and blocks) and secondary behaviors (eye blink, facial grimaces, jerky articulatory movements, and movements of extremities) that are overt and visible to others. However, covert features like anxiety, effortful speech production, high variability in stuttering based on different situations, individuals, and emotional states are not taken care of while assessing and providing rehabilitation.

This study intended to investigate speech effort in persons with stuttering under different sections, such as speech effort based on subsystems, speech effort in different situations, speech effort with different individuals, and speech effort in different emotional states. The study also probed into clinicians' and participants' viewpoints about successful stuttering therapy.

Two questionnaires were developed, consisting of rating scales and open-ended questions.

1.   Self-rated parameters of speech effort in stuttering.

2.   Clinician- rated parameters of speech effort in stuttering.

These questionnaires were distributed to respective groups to check the correlation between participants' and the clinicians' responses. The examiner (investigator of the study) also rated the questionnaire to check the inter-rater correlation.

In the present study, results revealed that there was no significant correlation between participants' and the clinicians' responses for questions related to speech effort based on subsystems, individuals, and situations. This may be due to the clinicians not being able to make an estimate of speech effort experienced by PWS outside the therapy setting

Participants reported greater speech effort while speaking in different situations like speaking in front of a large group and answering attendance. They also reported that they had higher speech effort while speaking with higher authorities and less effort while speaking with children, indicating that generalization of the therapy techniques with due focus on speech effort is essential in different situations and with different individuals.

Questions on speech effort in relation to different emotional states revealed that the majority of the participants had more speech effort when they anticipated stuttering. Participants also reported that they were scared before speaking and experienced negative emotions like disappointment, embarrassment, and anger following a stuttering episode.

Pertaining to questions related to therapy, participants reported that they felt comfortable using therapy techniques while speaking; however, many participants reported that the therapy program did not completely meet their goals. There was no

correlation between participants' and clinicians' ratings except only on one question on post-therapy. This may be because clinicians consider the efficacy of therapy based only on the overt behaviors, the covert behaviors such as sense of loss of control, unnatural sounding speech production, decreased ease of speech production, and increased speech effort are not given much importance.

Answer to open-ended questions also revealed that participants faced negative feelings after a stuttering episode and perceived negative opinions of others towards their speech. They also reported that stuttering negatively impacted their quality of life. So gathering information on clients' perspectives on successful stuttering therapy is critical, as it allows clinicians to understand clients' covert behaviors and helps to set suitable goals for establishing success in stuttering intervention.

Results also revealed that it is essential to consider respiratory, phonatory, and articulatory subsystems while planning intervention because incoordination between any of these can lead to aberrations in fluent speech. Speech effort comprises of both the physical and mental effort executed/ experienced by the person while speaking. A self-rating questionnaire would throw light on this speech effort experienced by PWS. Also, educating the client about stuttering for him/her to better understand his/her overt and covert features is also important in the effective rehabilitation of stuttering. Stuttering therapy is said to be successful when there is improvement in self-confidence and self-monitoring and when the client generalizes the therapy techniques in all situations. When the client experience lesser effort while speaking, it results in greater satisfaction with the therapy program.

6.1 The implication of the study

From the study, the following implications can be drawn.

The stuttering assessment protocol should be modified to have more out of therapy setting assessments to get a better idea about the speech effort involved in stuttering.

The patients' covert behaviors are difficult to assess and measure by the speech-language pathologists. Hence, with the help of a self-reporting inventory, an SLP can better probe into the clients' feelings, opinions, and attitudes towards his/her problem, motivation towards therapy, and expectations from therapy. These factors would indirectly contribute to a better understanding of mental effort in persons with stuttering.

This study provides a preliminary basis for investigating speech effort in stuttering and fluency-induced speech to aid in better diagnosis and management.

Working on speech effort would help in focusing more on speech naturalness in stuttering rehabilitation, which is also an important factor for making stuttering intervention successful.

References

Alm, P. A. (2004). Stuttering and the basal ganglia circuits: a critical review of possible relations. *Journal of Communication Disorders*, *37*(4), 325–369. https://doi.org/10.1016/j.jcomdis.2004.03.001

Autor: Oliver Bloodstein. (1995). *A handbook on stuttering*. Chapman & Hall.

Bauerly, K. R., Jones, R. M., & Miller, C. (2019). Effects of Social Stress on Autonomic, Behavioral, and Acoustic Parameters in Adults Who Stutter. *Journal of Speech, Language, and Hearing Research*, *62*(7), 2185–2202. https://doi.org/10.1044/2019_jslhr-s-18-0241

Beilby, J. M., Byrnes, M. L., Meagher, E. L., & Yaruss, J. S. (2013). The impact of stuttering on adults who stutter and their partners. *Journal of Fluency Disorders*, *38*(1), 14–29. https://doi.org/10.1016/j.jfludis.2012.12.001

Blood, G. W., & Blood, I. M. (2004). Bullying in Adolescents Who Stutter: Communicative Competence and Self-Esteem. *Contemporary Issues in Communication Science and Disorders*, *31*(Spring), 69–79. https://doi.org/10.1044/cicsd_31_s_69

Blood, G. W., Blood, I. M., Tellis, G., & Gabel, R. (2001). Communication apprehension and self-perceived communication competence in adolescents who stutter. *Journal of Fluency Disorders*, *26*(3), 161–178. https://doi.org/10.1016/s0094-730x(01)00097-3

Bloodstein, O. (1995). *A Handbook on Stuttering* (5th ed.). Cengage Learning.

Characteristics of Typical Disfluency and Stuttering. (n.d.). American Speech-Language-Hearing Association. https://www.asha.org/practice-portal/clinical-topics/fluency-disorders/characteristics-of-typical-disfluency-and-stuttering/

Charles Van Riper. (1982). *The nature of stuttering*. Englewood Cliffs, Nj Prentice-Hall.

Craig, A. R., & Hancock, K. (1995). Self-Reported Factors Related to Relapse following Treatment for Stuttering. *Australian Journal of Human Communication Disorders*, *23*(1), 48–60. https://doi.org/10.3109/asl2.1995.23.issue-1.04

Cream, A., Onslow, M., Packman, A., & Llewellyn, G. (2003). Protection from harm: the experience of adults after therapy with prolonged-speech. *International Journal of Language & Communication Disorders*, *38*(4), 379–395. https://doi.org/10.1080/13682820310001598166

Davidow, J. H., Grossman, H. L., & Edge, R. L. (2019). Stuttering Frequency, Speech Rate, Speech Naturalness, and Speech Effort During the Production

of Voluntary Stuttering. *Language and Speech*, *62*(2), 318–332. https://doi.org/10.1177/0023830918766962

Davidow, J. H., & Ingham, R. J. (2013). The effect of speech rate on stuttering frequency, phonated intervals, speech effort, and speech naturalness during chorus reading. *Journal of Communication Disorders*, *46*(2), 202–216. https://doi.org/10.1016/j.jcomdis.2012.11.003

De Nil, L. F., & Abbs, J. H. (1991). Influence of speaking rate on the upper lip, lower lip, and jaw peak velocity sequencing during bilabial closing movements. *The Journal of the Acoustical Society of America*, *89*(2), 845–849. https://doi.org/10.1121/1.1894645

Diehl, J., Robb, M. P., Lewis, J. G., & Ormond, T. (2018). Situational speaking anxiety in adults who stutter. *Speech, Language and Hearing*, *22*(2), 100–110. https://doi.org/10.1080/2050571x.2018.1441782

Ginsberg, A. P., & Wexler, K. B. (2000). Understanding Stuttering and Counselling Clients Who Stutter. *Journal of Mental Health Counselling*, *22*(3), 228–239.

Graham, V. (n.d.). *Speech Disorders (Articulation, Stuttering, Voice)*. Vicki Graham SLP. http://vickigrahamslp.weebly.com/speech-disorders-articulation-stuttering-voice.html

Guntupalli, V. K., Kalinowski, J., & Saltuklaroglu, T. (2006). The need for self-report data in the assessment of stuttering therapy efficacy: repetitions and prolongations of speech. The stuttering syndrome. *International Journal of Language & Communication Disorders*, *41*(1), 1–18. https://doi.org/10.1080/13682820500126627

Ham, R. E. (1990). What is stuttering: Variations and stereotypes. *Journal of Fluency Disorders*, *15*(5-6), 259–273. https://doi.org/10.1016/0094-730x(90)90041-p

Hemaraja Nayaka S. (2017, January 4). *1. fluency introduction*. Slideshare.net. https://www.slideshare.net/HemarajaNayakaS/1-fluency-introduction-70654761

Hogan, C. (2017). Relationship Between Self-Compassion, Self-Perception, and Stuttering Severity. *Graduate Independent Studies - Communication Sciences and Disorders*. https://ir.library.illinoisstate.edu/giscsd/5

Hoit, J. D., Lansing, R. W., & Perona, K. E. (2007). Speaking-Related Dyspnea in Healthy Adults. *Journal of Speech, Language, and Hearing Research*, *50*(2), 361–374. https://doi.org/10.1044/1092-4388(2007/026)

Ingham, R. J., Bothe, A. K., Jang, E., Yates, L., Cotton, J., & Seybold, I. (2009). Measurement of Speech Effort During Fluency-Inducing Conditions in Adults Who Do and Do Not Stutter. *Journal of Speech, Language, and Hearing Research*, *52*(5), 1286–1301. https://doi.org/10.1044/1092-4388(2009/08-0181)

Ingham, R. J., Bother, A. K., Wanga, Y., Purkhiser, K., & New, A. (2012). Phonation interval modification and speech performance quality during fluency-inducing conditions by adults who stutter. *Journal of Communication Disorders*, *45*(3), 198–211. https://doi.org/10.1016/j.jcomdis.2012.01.004

Kalinowski, J., & Dayalu, V. N. (2002). A common element in the immediate inducement of effortless, natural-sounding, fluent speech in people who stutter: "the second speech signal." *Medical Hypotheses*, *58*(1), 61–66. https://doi.org/10.1054/mehy.2001.1451

Klein, J. F., & Hood, S. B. (2004). The impact of stuttering on employment opportunities and job performance. *Journal of Fluency Disorders*, *29*(4), 255–273. https://doi.org/10.1016/j.jfludis.2004.08.001

Logan, K. J. (2014). *Fluency disorders*. Plural Publishing.

Loucks, T. M. J., & De Nil, L. F. (2006). Oral Kinesthetic Deficit in Adults Who Stutter: A Target-Accuracy Study. *Journal of Motor Behavior*, *38*(3), 238–247. https://doi.org/10.3200/jmbr.38.3.238-247

Loucks, T. M. J., De Nil, L. F., & Sasisekaran, J. (2007). Jaw-phonatory coordination in chronic developmental stuttering. *Journal of Communication Disorders*, *40*(3), 257–272. https://doi.org/10.1016/j.jcomdis.2006.06.016

Messenger, M., Onslow, M., Packman, A., & Menzies, R. (2004). Social anxiety in stuttering: measuring negative social expectancies. *Journal of Fluency Disorders*, *29*(3), 201–212. https://doi.org/10.1016/j.jfludis.2004.06.002

Moore, W. H. (1978). Some effects of progressively lowering electromyographic levels with feedback procedures on the frequency of stuttered verbal behaviors. *Journal of Fluency Disorders*, *3*(2), 127–138. https://doi.org/10.1016/0094-730x(78)90012-8

O'Brian, S., Onslow, M., Cream, A., & Packman, A. (2003). The Camperdown Program. *Journal of Speech, Language, and Hearing Research*, *46*(4), 933–946. https://doi.org/10.1044/1092-4388(2003/073)

O'Brian, S., Jones, M., Packman, A., Menzies, R., & Onslow, M. (2011). Stuttering severity and educational attainment. *Journal of Fluency Disorders*, *36*(2), 86–92. https://doi.org/10.1016/j.jfludis.2011.02.006

Perkins, W., Rudas, J., Johnson, L., & Bell, J. (1976). Stuttering: Discoordination of Phonation with Articulation and Respiration. *Journal of Speech and Hearing Research*, *19*(3), 509–522. https://doi.org/10.1044/jshr.1903.509

Peters, H. F. M., & Boves, L. (1988). Coordination of Aerodynamic and Phonatory Processes in Fluent Speech Utterances of Stutterers. *Journal of Speech, Language, and Hearing Research*, *31*(3), 352–361. https://doi.org/10.1044/jshr.3103.352

Riley, J., Riley, G., & Maguire, G. (2004). Subjective Screening of Stuttering

severity, locus of control and avoidance: research edition. *Journal of Fluency Disorders*, *29*(1), 51–62. https://doi.org/10.1016/j.jfludis.2003.12.001

Saltuklaroglu, T., & Kalinowski, J. (2002). The end-product of behavioral stuttering therapy: three decades of denaturing the disorder. *Disability and Rehabilitation*, *24*(15), 786–789. https://doi.org/10.1080/09638280110111333

Sheehan, J. G., & Martyn, M. M. (1970). Stuttering and Its Disappearance. *Journal of Speech and Hearing Research*, *13*(2), 279–289. https://doi.org/10.1044/jshr.1302.279

Starkweather, C. W. (1987). *Fluency and stuttering*. Prentice-Hall.

Stuttering - Symptoms and causes. (2017). Mayo Clinic; https://www.mayoclinic.org/diseases-conditions/stuttering/symptoms-causes/syc-20353572

Tichenor, S., Leslie, P., Shaiman, S., & Yaruss, J. Scott. (2017). Speaker and Observer Perceptions of Physical Tension during Stuttering. *Folia Phoniatrica et Logopaedica*, *69*(4), 180–189. https://doi.org/10.1159/000486032

Tichenor, S., & Yaruss, J. S. (2018). A Phenomenological Analysis of the Experience of Stuttering. *American Journal of Speech-Language Pathology*, *27*(3S), 1180–1194. https://doi.org/10.1044/2018_ajslp-odc11-17-0192

Werle, D., & Byrd, C. T. (2021). College professors' perceptions of students who stutter and the impact on comfort approaching professors. *Journal of Fluency Disorders*, *67*,. https://doi.org/10.1016/j.jfludis.2020.105826

Wingate, M. E. (1976). *Stuttering : theory and treatement*. Irvington Publishers.

Self-rated parameters of speech effort in stuttering

Consent form:

I hereby give consent to participate in the study titled "Self-rated and clinician-rated parameters of speech effort in stuttering." I have been briefed about the purpose of the study which is to explore the self-reported parameters of speech effort in persons with stuttering. I express my wholehearted consent to participate in the study. I have also been informed about the approximate time of testing and understand that the procedure is purely unharming with research benefits only. I agree to cooperate with the investigator in this study.

Name:

Age/gender:

Occupation:

Brief history of the stuttering

When/at what age did your stuttering begin?

Does anyone in your family stutter/used to stutter? How are you related to him/her?

Do you stutter more:

a) At the beginning/ any other position of the sentence?

b) What are the sounds that you feel difficulty in producing?

What do you do when you stutter?

How do you manage your stuttering?

Sl. No.	Effort based on subsystems:	Not at all (0)	A little (1)	A lot (2)	Always (3)
	Do you have any difficulties related to the following questions? If yes, rate how effortful is it?				
1.	**Respiration:** Do you run out of breath while speaking?				
2.	Do you feel any tension/contraction of abdominal muscles?				
3.	**Phonation:** Do you get stuck in the throat while attempting to speak?				
4.	Do you feel tension/tightness in the neck region while speaking?				
5.	**Articulation:** Do you feel that you are not able to control your articulators(tongue, lip, and jaw) while speaking?				
6.	Do you feel your articulators (tongue, lip, and jaw) are stiff/ tensed when you are speaking?				
7.	During your speech, rate the effort for each of the following	**No difficulty (0)**	**Little difficult (1)**	**Quite difficult (2)**	**Very difficult (3)**
I.	Breathing/airflow				
II.	Producing sound/voice				
III.	Articulating the sounds				
	Effort based on situation. Rate how effortful is your speech in the following situations	**No difficulty (0)**	**Little difficult (1)**	**Quite difficult (2)**	**Very difficult (3)**
1.	Answering phone/ Making phone calls				
2.	Reading non-familiar material				
3.	Reading with repeated practice				

		No difficulty (0)	Little difficult (1)	Quite difficult (2)	Very difficult (3)
4.	Introducing self				
5.	Speaking within the stipulated time				
6.	Speaking in front of a large group				
7.	Answering questions/ giving attendance				
	Effort of speech based on individuals. How difficult is it for you to speak to the following individuals?	**No difficulty (0)**	**Little difficult (1)**	**Quite difficult (2)**	**Very difficult (3)**
1	Parents				
2	Colleagues/ classmates/ friends				
3	Strangers				
4	Relatives				
5	Superiors or higher authorities				
6	Children				
	Speech effort in relation to emotional state.	**Not at all (0)**	**A little (1)**	**A lot (2)**	**Always (3)**
1	Do you anticipate stuttering? How much effort (anxiety/fear) do you experience when you anticipate stuttering?				
2	Do you feel sad or disappointed when you stutter? If yes, rate it.				
3	Does your speech become more effortful? when you are	**Not at all (0)**	**A little (1)**	**A lot (2)**	**Always (3)**
	a) Happy				
	b) Sad				
	c) Anxious/ excited				
4	Do you get scared before speaking? If yes, rate it				
5	Do you face negative				

	emotions after a stuttering episode? If yes, rate the following				
	a) Embarrassment				
	b) Disappointment				
	c) Anger				

Open-ended questions:

1.	**Reaction to stuttering** i) What do you think about yourself after you stutter?
	ii) What do you feel about others' perceptions of you after you stutter?
2.	How is stuttering affecting your quality of life?

Stuttering therapy: Do you feel comfortable while using the therapy technique?		**Yes**	**No**

	No difficulty (0)	Little difficult (1)	Quite difficult (2)	Very difficult (3)
a) Rate your speech effort while using the therapy techniques?				

3. i) Have you used the following techniques while managing your fluency? Also state difficulty or effort level while using those techniques

	No difficulty (0)	Little difficult (1)	Quite difficult (2)	Very difficult (3)
Airflow (Yes/ No). If yes, rate it				
Prolongation (Yes/ No). If yes, rate it				
Others (Yes/ No). If yes, mention and rate it				

What are your viewpoints about successful stuttering therapy?

		No	Somewhat	Yes
a)	Do you feel your speech has			

	become fluent after attending therapy?			
b)	Do you like the way you sound?			
c)	Has your speaking skills become more spontaneous/ automatic?			
d)	Can you independently use the therapy techniques			
e)	Do you feel increased sense of control over your speech, including stuttering?			
f)	Are you able to communicate effectively?			
g)	Has your understanding of stuttering and fluency increased after attending therapy?			
h)	Are you satisfied with the therapy program?			
i)	Did the therapy meet your goals?			
j)	Are you comfortable as a speaker?			
k)	Do you feel anxious about your speech while using the therapy techniques?			
l)	After therapy, do you still anticipate/avoid stuttering?			

Clinician-rated parameters of speech effort in stuttering

Clinician name:

Current educational qualification:

Number of years of experience in stuttering management:

Client name:

SSI-4 Score: **Stuttering severity:**

Speech effort: Speech is said to be fluent when there is a smooth flow of words, phrases, and sentences with no/minimal effort. When a person stutters, he/she might exert effort on various subsystems, and this effort may vary with different individuals and in different situations. Speech effort includes both physical and mental effort which may get exaggerated during stuttering.

The following questionnaire contains questions related to speech effort in persons with stuttering and can be used for assessment during therapy and post-therapy.

The clinician has to score the client's effort when he/she is speaking. This can then be compared withthe "Self-rated parameters of speech effort in stuttering" questionnaire which measures the client's perception of his/ her speech and covert behaviors.

SL.No.	**Open-ended questions:**
1	What is speech effort according to you?
2	Which subsystems do you target during therapy?
3	How will you measure speech effort?
4	What are the goals you consider while planning for fluency therapy?
5	What is your viewpoint about successful stuttering therapy?

Sl. No.		No difficulty (0)	Mild difficulty (1)	Moderate difficulty (2)	Severe difficulty (3)
	Effort based on subsystems Does client have any difficulties related to the following questions? If yes rate how effortful is it?				

1	**Respiration:** Does the client run out of breath?				
2	Do you visualize any contraction in client's abdominal muscles while he/she is speaking?				
3	**Phonation:** Does the client get stuck while attempting to speak?				
4	Do you observe the presence of any tension/tightness in the neck region of the client while he/she is speaking?				
5	**Articulation:** Do you visualise any involuntary movements in the articulators of the client while he/she is speaking?				
6	Do you observe presence of any stiffness or tension in the articulators (tongue, lip and jaw) of the client when he/she is speaking?				
7	**Rate the speech effort exerted in the following subsystems**	**No difficulty (0)**	**Mild difficulty (1)**	**Moderate difficulty (2)**	**Severe difficulty (3)**
I	Respiration				
II	Phonation				
III	Articulation				
	Effort based on situation Rate the client's effort for speech in the following situations?	**No difficulty (0)**	**Mild difficulty (1)**	**Moderate difficulty (2)**	**Severe difficulty (3)**
1.	Answering phone/ Making phone calls				
2.	Reading non-familiar material				
3.	Reading with repeated practice				
4.	Introducing self				
5.	Speaking within stipulated time				

	Effort based on individuals Rate the client's effort while speaking with following individuals?	**No difficulty (0)**	**Mild difficulty (1)**	**Moderate difficulty (2)**	**Severe difficulty (3)**
1	Parents				
2	Colleagues/ classmates/ friends				
3	Strangers				

What is your viewpoint about successful stuttering therapy?

		No improvement	**Some improvement**	**Good improvement**
a)	Enhanced speech fluency			
b)	Natural sounding speech			
c)	Reduced effort while speaking.			
d)	Independent use of therapy techniques.			
f)	Reduced avoidance or anticipatory behaviors.			
g)	Client confidence			
h)	Increased knowledge and understanding of fluency and stuttering.			
i)	Reduced severity of stuttering			