# A COMPARISON OF TOLERANCE FOR THE PERCEPTION OF STUTTERED SPEECH IN MOTHERS OF CHILDREN WHO DO AND DO NOT STUTTER

**Hani Sulthana**

**Registration Number: P01II22S123009**

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**the Degree of Master of Science (Speech-Language Pathology)**

**University of Mysore**

**All India Institute of Speech and Hearing, Manasagangothri, Mysore**

**– 570006**

**July, 2024**

# CERTIFICATE

This is to certify that the dissertation entitled **'A comparison of tolerance for the perception of stuttered speech in mothers of children who do and do not stutter'** is a bonafide work submitted in partial fulfillment for the degree of Master of Science (Speech-Language Pathology) of the student registration number: P01II22S123009. It has been carried out under the guidance of a faculty of this institution and has not been submitted earlier to any other university for the award of any diploma or degree.

Mysore

July 2024

**Dr. M. Pushpavathi**

**Director**

All India Institute of Speech and Hearing

Manasagangothri, Mysore – 570006

# CERTIFICATE

This is to certify that the dissertation entitled **'A comparison of tolerance for the perception of stuttered speech in mothers of children who do and do not stutter'** has been prepared under my supervision and guidance. It is also certified that this dissertation has not been submitted earlier to any other university for an award of any diploma or degree.

Mysore

July 2024

Guide

**Dr. Santosh M**

**Professor of Speech Sciences**

Department of Speech-Language Sciences

All India Institute of Speech and Hearing

Manasagangothri, Mysore – 570006

# DECLARATION

This is to certify that the dissertation entitled **'A comparison of tolerance for the perception of stuttered speech in mothers of children who do and do not stutter'** is a result of my own study done under the guidance of Dr. Santosh M, Professor of Speech Sciences, Department of Speech-Language Sciences, All India Institute of Speech and Hearing, Mysore. This dissertation has not been previously submitted to any other university for the award of any diploma or degree.

Mysore **Registration No.: P01II22S123009**

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Dedicated to Abbu & Mumma

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# CHAPTER I

## INTRODUCTION

Fluency is a continuous, effortless production of long utterances at a rapid rate (Starkweather, 1980). The term disfluencies refers to interruptions in the forward flow of speech. The prefix ‘dis’ signifies reversal, separation, and negation. Disfluencies are usually perceived to normally interrupting the flow of speech (Wingate, 1964). Dysfluencies, however, signify abnormality in the motoric breakdown of fluency, as indicated by the prefix 'dys,' which explicitly conveys the concept of abnormality. Stuttering is a speech fluency disorder characterized by syllable or part-word repetitions, prolongations, and blocks or broken words that disrupt the natural flow of speech (Guitar, 2013).

According to a recent study by Yairi and Ambrose (2022), it was found that the onset of stuttering is observed between 24-36 months in 60%, 42 months in 85%, and 48 months in 95% of children who stutter. Numerous studies have been conducted to study the characteristics of stuttering during the onset of stuttering. Pellowski & Conture (2002) found that English-speaking children who do not stutter (CWNS) in the age range of 3 to 4 years had mean scores of 1.5 and 1.1 for stuttering-like dysfluencies (SLDs) and other disfluencies (ODs), respectively. On the other hand, for children who stutter (CWS), the mean was 2.0 for ODs and 8.7 for SLDs. It was observed that there was no significant difference in ODs between CWS and CWNS. In the Indian context, findings from an unpublished thesis by Ram (2013) suggest that among Kannada-speaking preschool children, SLDs such as syllable repetition, part-word repetition, and dysrhythmic phonation consisting of blocks, prolongation, and broken words were found to be more robust in the differentially diagnosing normal disfluencies and stuttering. Additionally, ODs, such as multisyllabic word repetitions, interjections, and

revisions, were more predominant in CWNS. Hence, SLDs are considered to classify between CWS and CWNS.

Parents and preschool teachers spend most of their time with children. Hence, they are among the first to notice disfluencies in children (Smith, 1959). The difficulty distinguishing between normal nonfluencies and stuttering often tends to misdiagnose stuttering (Johnson et al., 1959). Parents of CWS have higher standards and expectations from their children, especially mothers, who are more concerned, critical, and domineering than parents of normally fluent children (Moncur, 1952; Darley, 1955). Hence, it is necessary to perceptually evaluate parents judgments of stuttering across different frequencies and types of *dis+dys*fluencies.

**Need for the study**

Children in the age range of 2 to 6 years are not only particularly disfluent (Muma, 1971), but the onset of stuttering is most frequently observed during this period of development (Johnson et al., 1959; Van Riper, 1971). Parents are the ones who first identify the onset of normal nonfluencies and often tend to misdiagnose stuttering (Johnson et al., 1959). The accuracy of parent's judgment is essential as clinicians depend on parents to provide information regarding the onset of stuttering (Ingham & Einarsdottir, 2008). Numerous studies in the past have been conducted to study parental judgment about stuttering (Berlin, 1957; Bloodstein et al., 1957; Zebrowski & Conture, 1989; Ingham & Einarsdottir, 2008). Several investigations have been conducted through interviews and other methods, such as simulation of stuttering by adults and children, use of reading samples, or spontaneous speech for judging the sample. However, it is unclear how simulated stuttering resembles ‘real’ stuttering. Therefore, digital technology is needed to edit recorded samples. By editing the stuttering moments, such as extending the duration of sounds on fluent words to make it sound like prolongation, duplicating the fluent word, making it whole word repetition, etc., the perceived

severity of stuttering can be varied. Thus, with all these, it is possible to improve the quality and avoid erroneous judgments of stuttering alone (Susca & Healey, 2001 ). Several studies have asked listeners to evaluate the sample as 'stuttering' or 'non-stuttering.' However, the bias of giving instructions to judge whether the sample was stuttered or not stuttered has led to frequent judgments of stuttering. Additionally, only a few studies have objectively studied the perception of stuttered speech across different types and frequencies of *dis+dys*fluencies (Bloodstein et al., 1957). Hedge and Hartman (1979a) developed an alternative method to evaluate the samples on a continuum of fluent, disfluent, or stuttered speech across different types and frequencies of *dis+dys*fluencies. As the frequency of these *dis+dys*fluencies increases, the listener would judge the sample to be stuttered. Past studies have also demonstrated that part-word repetition, prolongations, tense pauses, and dysrhythmic phonations are more frequently judged as stuttering, and whole-word or phrase repetitions and interjections are less likely to be termed stuttering. Hence, there is a need to distinguish between SLDs and ODs at different frequency levels. While numerous studies have studied the judgment of stuttering across different types and frequencies of *dis+dys*fluencies, to the best of the author's knowledge, none have incorporated parents as participants. Additionally, there is a paucity of Indian- specific studies in this area. The perception of stuttering towards individuals who stutter may vary significantly, particularly in a culturally and linguistically diverse country like India. This highlights the need for the proposed research to contribute to the existing knowledge. Therefore, there is a need to determine whether differences occur in mothers of children who stutter (MCWS) and mothers of children who do not stutter (MCWNS.) when judging a speech sample as fluent, disfluent, or stuttered.

**Aim of the study**

To investigate and compare the perceptual thresholds of identifying stuttered speech in mothers of children who stutter (MCWS) and mothers of children who do not stutter (MCWNS).

**Objectives of the study**

1. To compare the perceptual thresholds of identifying stuttered speech between MCWS and MCWNS in speech samples with different frequencies and types of *dis+dys*fluencies.
2. To compare the perceptual thresholds for recommending a child to speech therapy between MCWS and MCWNS in speech samples with different frequencies and types of *dis+dys*fluencies.

# CHAPTER II

## REVIEW OF LITERATURE

The onset of stuttering, on average, is around 2.58 years (Yairi & Ambrose, 2013). During this stage, the difficulty distinguishing between normal non-fluencies and stuttering causes parents to diagnose children with stuttering erroneously (Johnson et al., 1959). Numerous studies have been conducted to investigate how listeners perceive and react to fluent and disfluent speech (Panico et al., 2005).

Johnson's diagnostic theory states that stuttering in young children develops after the diagnosis by parents. Furthermore, Johnson and Associates (1959) were also of the opinion that it was difficult to record samples of a child's dysfluencies just during the onset of stuttering. Hence, they interviewed 246 parents of children who stutter and 246 parents of normally fluent children. They found that parents of children who stutter tend to diagnose normal nonfluencies as stuttering more frequently than the other group. In line with these findings, Bloodstein et al. (1957) were among the first to study Johnson's diagnostic theory of stuttering. They hypothesized that parents of children who stutter would make a diagnosis of stuttering more frequently than a group of parents of children who do not stutter. Participants included 24 married couples in each group and were asked to judge the speech samples as a 'stutterer' or a 'normal speaker.' The recordings included 12 two-minute samples from 12 children; six were non-stutters, and six were considered stutters. The principal finding was that parents of children who stutter made a diagnosis of stuttering in larger numbers than the other group. Further, there was no significant difference in the diagnosis of stuttering by mothers and fathers among both groups. They concluded that parents of children who stutter have high expectations regarding fluency and are more inclined towards their children than the control group.

To investigate how judgments differed by avoiding the term ‘stuttering’ while giving instructions, Berlin (1957) examined how parents diagnose and perceive stuttering in their children. Speech samples were constructed in a continuum from total fluency to nonfluency to stuttering. Eight samples with 100-word scripts were read out as if telling a story by a group of third-grade children. A total of 210 parents, 43 families with at least one child who stuttered, 58 with at least one child with misarticulations, and 36 with no speech problems participated in the study. Samples were played under two conditions. In Condition 1, parents were asked if the child’s speech caused concern and what caused it, whereas in Condition 2, they were asked if the child stuttered. Most parents rendered more judgments of stuttering; it was also found that mothers of normal-speaking children did not change their judgments across the two conditions. They concluded that wording of instruction influences as it was observed that parents of stuttering children misdiagnosed normal nonfluency with stuttering, indicating that they were more intolerant towards the judgment of stuttering.

From the above review, it is found that parents of stuttering children are more inclined towards stuttering, but to investigate how judgments would differ across different dysfluencies, Zebrowski and Conture (1989) studied the relationship between mothers' judgments of speech disfluencies with different types of disfluencies, duration, and number of iterations per instance of repetition. Participants included ten mothers of children who stutter and ten mothers of normally fluent children; each had to evaluate the sample as either ‘stuttered’ or ‘not stuttered.’ The sample recorded was an imitative production by a young stutter, which included five different types of speech disfluency, such as sound prolongations and sound/syllable repetitions of five different durations, along with the fluent sample. They found no significant difference in both groups, although there were differences in frequency concerning various types of disfluencies. It was seen that both groups of mothers judge sound/syllable repetitions to be stuttered, followed by whole-word repetition, monosyllabic words, and broken words. In

contrast, most participants judged fluent words, interjections, and sound prolongations as not stuttering. They conclude that there is a heightened sensitivity for disfluencies in both groups and that judgment of disfluencies depends on the type of disfluencies present within the child. These results do not align with Johnson and Associates' (1959) findings.

Parents are the ones who first identify stuttering. To investigate the accuracy of parental identification of stuttering, Ingham and Einarsdottir (2008) conducted a study which included 20 parents of children who stutter and 20 parents of children who do not stutter. Participants were asked to make judgments of stuttering when presented with 3-minute audio-visual samples of their children. Participants made judgments for a 3-minute sample on three consecutive trials. Both groups showed increased levels of accuracy. However, parents of children who stutter showed significantly higher accuracy in judging the sample as stuttered than those of children who do not. They concluded that parents could be considered reliable and accurate in judging occurrences of stuttering.

There have been a several investigations through interviews, simulating stuttering etc., to study perception of stuttering with students and other unsophisticated listeners. One such method was developed by Hegde and Hartmann (1979a, 1979b). They studied listeners' ability to recognize stuttering behaviors. They introduced varying frequencies of word repetitions and interjections at 1%, 5%, 10%, 15%, and 20% of words in the initial paragraph of the rainbow passage. Participants who were students were asked to judge these samples as "fluent," "disfluent," or "stuttered" and make recommendations for therapy based on the speech sample. The results revealed that the presence of more than 5% of word repetitions and interjections consistently evoked judgment of disfluency by the listeners. They observed that as the frequency of interjections and word repetitions reached a specific number, the speech was considered disfluent or stuttered, and listeners recommended speech therapy. They concluded that perception of various disfluencies differs among listeners and depends mostly on the

frequency of disfluencies and not just on the type of disfluencies. Similar studies have found a lower "threshold of tolerance" for part-word repetition, prolongation, and intralexical pauses compared to schwa interjections and phrase repetitions. The findings of these studies show that the “non-stuttering” type of dysfluencies also evokes judgment of stuttering at higher frequencies. However, the traditional “stuttering” forms do so at a lower frequency. Hence, differential thresholds exist for different types of disfluencies (Hegde et al., 1984, 1988, 1991).

On a similar line, Dejoy and Jordon (1988) studied how listeners judged the samples across different dimensions of speech fluency and competence in orally read and spontaneous speech samples. They also investigated the frequency at which negative characteristics could be elicited for the same. The authors recorded two passages, one that represented an oral passage with varying amounts of schwa interjections inserted in one passage and a control passage with no other disfluencies was inserted. Along with spontaneous speech, schwa interjections were used. Participants were asked to judge the passage as fluent, disfluent, or stuttered and complete the semantic differential procedure on a 21-seven-point rating scale. It was demonstrated that as the frequency of schwa interjections increased, the frequency of negative ratings increased. There was no significant difference between oral reading and spontaneous speech. Additionally, listeners classified disfluent samples as stuttered, and in reading conditions, nearly one-third of the listeners judged speech as stuttered. Similarly, Susca and Haeley (2001) studied how listeners perceive stuttering by systematically manipulating the level of stuttering within a core sample. They created six distinct samples with varying frequencies of simulated stuttering. A total of 60 participants were randomly assigned one sample and asked to rate the sample on a Likert scale of 1 to 7 for four statements indicating participants' perception of the speaker’s fluency and competence and their comfort level while listening to the sample. Participants were also asked open-ended questions to learn more about the perception of fluency. The study included qualitative and quantitative

assessments, and results revealed that samples with a higher level of simulated stuttering had lower ratings for speaker's fluency and competency. It was also concluded that listeners' judgment is not just on the presence or absence of dysfluencies. Furthermore, positive comments were observed for a sample with fewer dysfluencies, while a sample with a high level of dysfluencies received a high frequency of negative comments. Susca and Haeley (2005) continued this line of research and presented samples with either audiovisual or audio-only presented modes with a similar procedure as mentioned above; it was seen that there was no apparent difference in comments between the two presentation modes.

Sander (2001) investigated how different types and frequencies of syllable repetition (single and double unit repetition) affect the judgment of stuttering. A simulated sample from a 30-year-old was recorded, and 24 samples of 100 words each were made. Only one sample was played to 240 college-going students, who were interviewed concerning their reactions to syllable repetition. Participants were asked to describe the manner of speech and whether the speech was considered defective. Based on the responses to the previous questions, the participants had to answer whether the sample could be classified as a stutter. He found out that the majority of the listeners were aware of syllable repetition, and the presence of single-unit repetition was attributed to nervousness and loss of words, etc.; on the other hand, as the frequency of double-unit syllable repetition increased, there was an increase in growth of 'stutterer' judgment. In addition, if the sample contains less than eight instances of repetition, that was not judged as stuttered speech.

**Summary**

The literature review for the present study highlights that parents of CWS are accustomed to labeling normal nonfluencies as stuttering. Several studies have found that among SLDs, syllable repetition, part-word repetition, and dysrhythmic phonation consisting of blocks, prolongation, and broken words are observed in CWS, and ODs such as

multisyllabic word repetitions, interjections, and revisions are observed in both CWS and CWNS. Further, as the severity of *dis+dys*fluencies increases, there is a shift in judgment towards stuttering, suggesting that it is necessary to establish perceptual thresholds for different types and frequencies of *dis+dys*fluencies. Several methods have been established for judging the sample, such as adults imitating speech or simulating disfluencies and using technology to synthesize the samples. Among these, natural conversation samples are more reliable than the other methods mentioned. The literature review also noted a significant gap in studies with parents' judgments of stuttering across different types and frequencies of *dis+dys*fluencies. Thus, the aim of the study is to identify perceptual thresholds across different types and frequencies of *dis+dys*fluencies in mothers of children who stutter (MCWS) and mothers of children who do not stutter (MCWNS).

# CHAPTER III

## Methods

The primary aim of the current study was to investigate and compare the perceptual thresholds of identifying stuttered speech in mothers of children who stutter (MCWS) and mothers of children who do not stutter (MCWNS).

The following were the objectives of the current study:

1. To compare the perceptual thresholds of identifying stuttered speech between MCWS and MCWNS in speech samples with different frequencies and types of *dis+dys*fluencies.
2. To compare the perceptual thresholds for recommending a child to speech therapy between MCWS and MCWNS in speech samples with different frequencies and types of *dis+dys*fluencies.

### Study design

Standard group comparative study

### Sample size

The estimation of the sample size was based on the previous literature on a group of MCWS and MCWNS (Zebrowski & Conture, 1989). This study included 20 participants in each group. Hence, the current study recruited a minimum of 20 participants in each group.

### Participants

A total of 40 mothers whose children were in the age range of 3-6 years participated in the present study. The participants were divided into two groups. Group I included 20 MCWS, and Group II included 20 MCWNS. Convenient and purposive sampling were employed to select and recruit participants. The inclusion and exclusion criteria followed for the selection and recruitment of the participants were as follows:

#### *Inclusion criteria*

- All the participants were native Kannada speakers in and around Mysore with middle socioeconomic status (based on information obtained on socioeconomic status scale by Kuppuswamy, 2023.)
- Participants who reported intact hearing and normal communication skills were included in the study.
- Participants between the ages of 18 to 49 years were included in the study.
- Group I included mothers of children aged 3-6 years diagnosed with developmental stuttering by an experienced speech-language pathologist.
- Participants in group II were age-matched with CWS from group I.

***Exclusion criteria***

- Participants with a history of communication skills-related problems such as cognitive, hearing problems, speech and voice disorders, or psychological and neurological problems were excluded from the study.
- MCWNS with knowledge, familiarity, or contact with people who stutter were excluded from the study. The demographic details of Group 1 and Group 2 participants are given in Table 3.1 and Table 3.3, respectively. The details of CWS and CWNS are shown in Table 3.2 and Table 3.4, respectively.

**Table 3.1**

*Demographic details of the MCWS.*

| *Participant* | *Age of the participant (years)* | *Education of the participant* | *Occupation of the participant* |
|---|---|---|---|
| P1 | 33 | Post-Graduation | Housewife |
| P2 | 29 | Secondary education | Housewife |
| P3 | 27 | Under-Graduation | Housewife |
| P4 | 31 | Secondary education | Housewife |

| | | | |
|---|---|---|---|
| P5 | 39 | Secondary education | Housewife |
| P6 | 34 | Under-Graduation | Teacher |
| P7 | 24 | Secondary education | Housewife |
| P8 | 30 | Under-Graduation | Housewife |
| P9 | 24 | Secondary education | Housewife |
| P10 | 30 | Secondary education | Housewife |
| P11 | 35 | Under-Graduation | Housewife |
| P12 | 25 | Under-Graduation | Housewife |
| P13 | 35 | Post-Graduation | Housewife |
| P14 | 23 | Secondary education | Housewife |
| P15 | 28 | Under- Graduation | Housewife |
| P16 | 27 | Secondary education | Housewife |
| P17 | 39 | Under-Graduation | Housewife |
| P18 | 26 | Secondary education | Housewife |
| P19 | 23 | Secondary education | Housewife |
| P20 | 30 | Under-Graduation | Housewife |

**Table 3.2**

*Demographic details of the CWS*

| *Participant* | *Age of the child* | *Gender of the child* | *Handedness of the child* | *SSI-4 scores* | *Severity of Stuttering* | *Therapy taken* | *Duration of therapy* |
|---|---|---|---|---|---|---|---|
| P1 | 4.6 | M | Right | *8* | *Very mild* | Yes | Two months |
| P2 | 5.6 | M | Right | *16* | *Mild* | No | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| P3 | 3.5 | M | Right | *7* | *Very mild* | No | - |
| P4 | 6.3 | M | Right | *18* | *Mild* | No | - |
| P5 | 4.1 | F | Right | *20* | *Mild* | Yes | One month |
| P6 | 5.6 | M | Right | *25* | *Mild* | Yes | One month |
| P7 | 4.3 | M | Right | *20* | *Mild* | Yes | Two months |
| P8 | 3.5 | M | Right | *15* | *Mild* | No | - |
| P9 | 4.4 | M | Right | *25* | *Mild* | No | - |
| P10 | 5.1 | M | Right | *9* | *Very Mild* | No | - |
| P11 | 5.4 | M | Right | *16* | *Mild* | No | - |
| P12 | 4.4 | M | Right | *16* | *Mild* | No | - |
| P13 | 4.5 | M | Right | *15* | *Mild* | No | - |
| P14 | 5.1 | F | Right | *26* | *Mild* | No | - |
| P15 | 3.11 | M | Right | *11* | *Very Mild* | No | - |
| P16 | 3.11 | M | Right | *20* | *Mild* | No | - |
| P17 | 5.2 | F | Right | *17* | *Mild* | No | - |
| P18 | 5.9 | M | Left | *21* | *Mild* | No | - |
| P19 | 4.1 | F | Right | *22* | *Mild* | No | - |
| P20 | 3.0 | M | Right | *15* | *Mild* | No | - |

**Table 3.3**

*Demographic details of the MCWNS*

| Participant | Age of the *participant (years)* | *Education of the participant* | *Occupation of the participant* |
|---|---|---|---|
| P1 | 26 | Under-Graduation | Housewife |
| P2 | 27 | Secondary education | Housewife |
| P3 | 28 | Primary education | Housewife |
| P4 | 38 | Post-Graduation | Teacher |
| T | 34 | Under-Graduation | Housewife |
| P6 | 28 | Primary education | Housewife |
| P7 | 35 | Post-Graduation | Teacher |
| P8 | 31 | Post-Graduation | Teacher |
| P9 | 32 | Primary education | Housewife |
| P10 | 33 | Diploma | Housewife |
| P11 | 26 | Primary education | Housewife |
| P12 | 27 | Secondary education | Housewife |
| P13 | 30 | Secondary education | Housewife |
| P14 | 25 | Under- Graduation | Accountant |
| P15 | 30 | Secondary education | Housewife |
| P16 | 30 | Primary education | Housewife |
| P17 | 43 | Under Graduation | Teacher |
| P18 | 36 | Under Graduation | Teacher |
| P19 | 37 | Post-Graduation | Teacher |
| P20 | 32 | Post-Graduation | Teacher |

**Table 3.4**

*Demographic details of the CWNS*

| Participant | Age of the child | Gender of the child | Handedness of the child |
|---|---|---|---|
| P1 | 3.5 | M | Right |
| P2 | 3.5 | M | Right |
| P3 | 4 | F | Right |
| P4 | 4.11 | M | Right |
| P5 | 5.4 | M | Right |
| P6 | 5.4 | M | Right |
| P7 | 5.8 | F | Right |
| P8 | 4.4 | F | Right |
| P9 | 5.8 | F | Right |
| P10 | 5.3 | F | Right |
| P11 | 4.5 | M | Right |
| P12 | 4.0 | M | Left |
| P13 | 4.5 | F | Right |
| P14 | 5.6 | F | Right |
| P15 | 3.4 | M | Right |
| P16 | 3.0 | M | Right |
| P17 | 6.0 | M | Right |
| P18 | 4.5 | F | Right |
| P19 | 4.9 | M | Right |
| P20 | 4.7 | M | Right |

*Note. Male = male, F = female*

**Stimuli**

A spontaneous speech sample with a minimum duration of two minutes was obtained from a 7.3-year-old child diagnosed with developmental stuttering. The child had moderate severity of stuttering based on the Stuttering Severity Instrument – Fourth Edition (SSI-4) assessed by a speech-language pathologist with four years of experience. Prior informed consent was taken from the parents.

***Construction of the stimuli***

After recording the speech sample, Audacity 3.3.3 was used to edit the *dis*+*dys*fluencies and synthesize the speech sample. Ram (2013) observed that the most prominent *dis*+*dys*fluencies among pre-school Kannada-speaking CWS included part-word repetitions (PWR) in stuttering-like dysfluencies (SLDs) and whole-word repetitions (WWR) in other disfluencies (ODs). In line with these findings, the present study edited samples by deliberately incorporating and retaining PWR and WWR. The following steps were incorporated when the samples were modified.

**Step 1- Speech samples with only ODs.**

The original sample had 103 words with a duration of 1.53 minutes. Initially, noise, probing questions, and other dis+*dys*fluencies, such as part-word repetitions and prolongations, were removed, and only WWRs were retained. This served as a core sample with 10 WWRs. To create a sample with 15% *dis*+dysfluencies, as depicted in Figure 3.1, the word that has to be duplicated will be selected and copied, then will be pasted as depicted in Figure 3.2, similarly five *dis*+dysfluencies were added to the words 'Christmas,' 'gadda ella,' 'kaigella,' 'strawberry,' and 'atom bomb', ensuring an equal distribution of *dis*+dysfluencies throughout the sample. Later, five WWRs were removed to create a sample with 10% *dis*+dysfluencies. Subsequently, the same sample was modified to create a sample with 7% *dis*+dysfluencies by removing three WWRs. Further, the sample was modified to make 5%, 3%, and 1%

*dis*+dysfluent samples. It was ensured that all *dis*+dysfluencies were evenly dispersed throughout the samples. A total of six samples were created, each containing only WWR.

**Figure 3.1**

*Selection of the word for duplication*

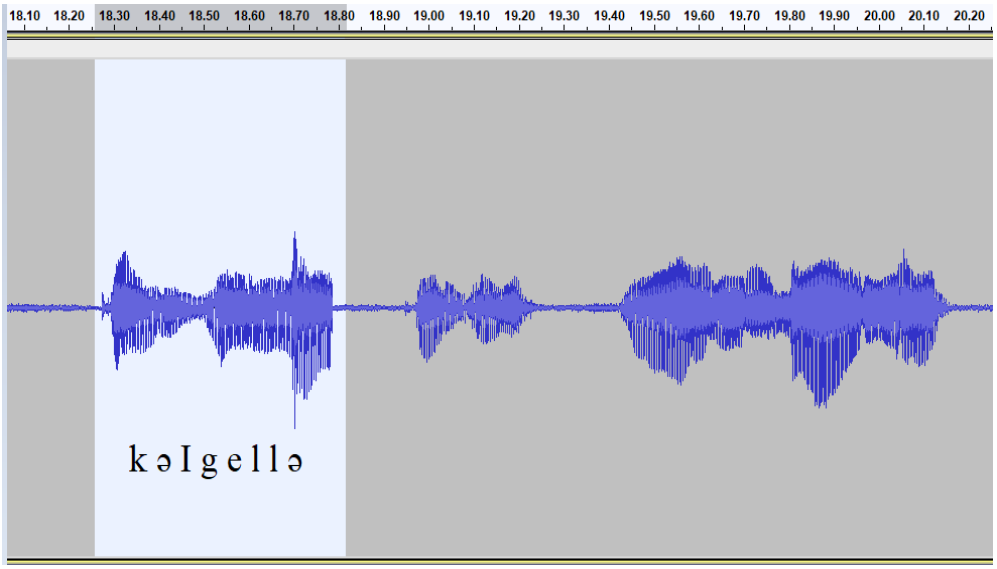
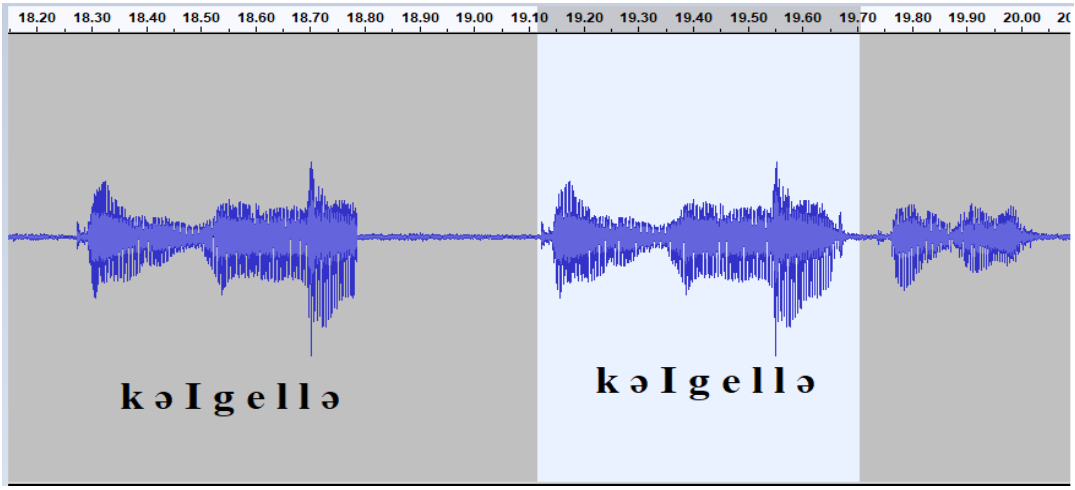



**Figure 3.2**

*Duplication of word indicating whole-word repetition*




**Step 2- Speech samples with only SLD.**

All the dis+*dys*fluencies except for PWR were removed. The original sample had 15 PWR, making it a 15 % dis+*dys*fluent sample, and this served as a core sample. As mentioned,

a similar procedure was followed: eliminating PWR from the core sample. As depicted in Figure 3.3 and Figure 3.4, part word repetitions were selected and then deleted, and samples with 10%, 7%, 5%, 3%, and 1% dis+*dys*fluencies were created. A total of six samples were made, each containing only PWRs.

**Figure 3.3**

*Selection of word-removing part-word repetition*

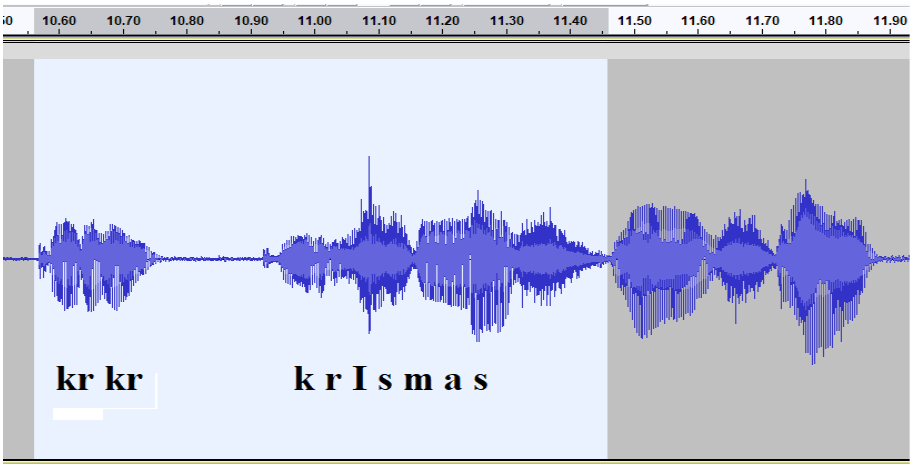
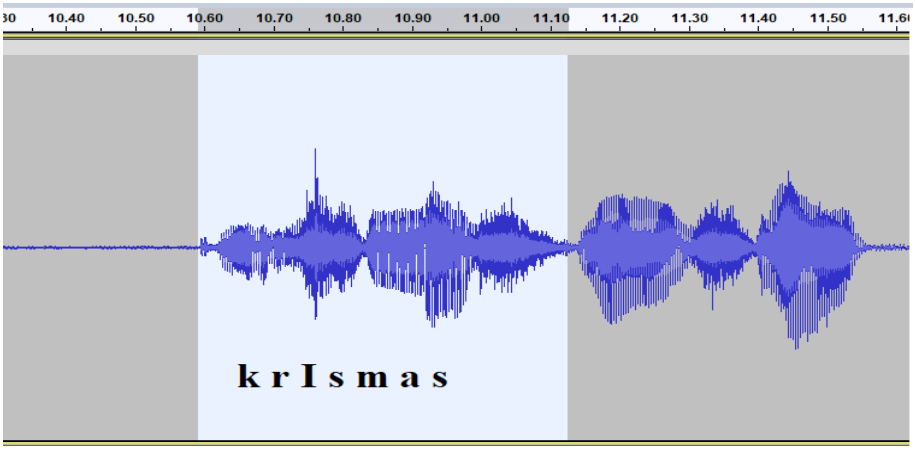



**Figure 3.4**

*Removal of part-word repetition*




**Step 3- Speech samples with both SLD and OD.**

All the *dis+dys*fluencies except for PWR and WWR were removed. The core sample with 7 PWRs and 8 WWRs were made, making it a 15% *dis+dys*fluent sample. Further, with a similar procedure as mentioned above, a sample with 10% *dis+dys*fluencies with 5 PWR and

5 WWR, 7% *dis+dys*fluencies with 4 PWR and 3 WWR, 5% *dis+dys*fluencies with 2 PWR and 3 WWR, 3% *dis+dys*fluencies with 2 PWR and 1 WWR, and 1% *dis+dys*fluencies with 1 PWR and 1 WWR were created. A total of six samples were created with both PWR and WWR.

**Validation of the samples**

All 18 samples were randomized and given to three native Kannada-speaking speech-language pathologists with a minimum experience of five years. All the raters were instructed to validate the sample by identifying the type and frequency of *dis+dys*fluencies and no. of iterations. If the type of *dis+dys*fluencies identified was other than PWR and WWR, it was edited accordingly. It was ensured that only *dis+dys*fluencies agreed upon by all three speech-language pathologists were considered.

**Procedure**

Prior written consent was obtained from all participants. Participants were seated in a quiet environment with no visual distractions. They were informed about the study, and a Socioeconomic scale (Kuppuswamy, 2023) was administered, and other demographic details such as name and age were obtained. All the samples were randomized for each participant and were played through headphones at a comfortable listening level. After every nine samples, participants were given a 4-5-minute break. The participants were asked to judge all the samples presented randomly. The sample was played only once. After listening to each sample, participants were asked two questions. The first question was to evaluate the samples as either 'Fluent,' 'Disfluent,' or 'Stuttered' speech. Further, based on the response to the first question as stuttered or disfluent, they were asked to indicate whether they would recommend speech therapy to the speaker of the sample and were asked to choose 'Yes' or 'No' as the response. Responses were collected through Google Forms, as mentioned in Appendix I

The instruction -

*You will be made to listen to 18 samples. After each sample, you need to judge whether the sample is fluent, disfluent, or stuttered; if stuttered or disfluent, you must also mention whether speech therapy is required. Fluent refers to the smooth flow of speech without interruptions, disfluent means the sample contains dis+*dys*fluencies, usually observed usually observed among typically developing children during the development of speech and language, and stuttered means having stuttering-like dysfluencies. The sample will be played only once, and no other information will be provided regarding the age. Please listen carefully and judge.*

**Reliability**

To assess intra-judge reliability, 10% of the participants from both groups, that is, randomly selected two participants from each group, judged the samples for the second time. A minimum of the 1-week gap duration was provided for the same.

**Statistical analysis**

The data was tabulated and subjected to the Statistical Package for the Social Sciences (SPSS, Version 27) software for descriptive statistics. A modal score was used to determine the number of responses obtained for the judgment of fluent, disfluent, or stuttered speech and responses for speech therapy recommendations in both groups. Friedman's two-way analysis of variance by ranks was applied between the six (1%, 3%, 5%, 7%, 10%, and 15%) frequencies of *dis+dys*fluencies for both groups. A Cochran's Q test was performed on the responses to recommendations for speech therapy. A chi-square test was conducted to determine the difference between the judgment of MCWS and MCWNS regarding *dis+dys*fluencies and the recommendation of speech therapy. Intra-rater reliability was checked for both groups using Cohen's Kappa coefficient.

# Chapter IV

# RESULTS

The current study aimed to investigate and compare the differential thresholds of identifying stuttered speech in mothers of children who stutter (MCWS) and mothers of children who do not stutter (MCWNS). Forty mothers with children in the age range of 3 to 6 years participated in the study. Group I included 20 MCWS, and Group II included 20 MCWNS. Participants were asked to judge randomly presented samples across different frequencies of *dis+dys*fluencies (1%, 3%, 5%, 7%, 10%, and 15%) and types of *dis+dys*fluencies (PWR, WWR, and Both PWR and WWR). The first question was to evaluate the sample as 'fluent,' 'disfluent,' or 'stuttered,' and based on the response to the first question, to recommend speech therapy by choosing 'yes' or 'no' as a response. The obtained responses were tabulated and subjected to statistical analysis. The following analyses were carried out to achieve the study's objectives, and the results are divided into the following sections.

## 4.1 Thresholds of Judgment of Disfluencies and Stuttering across Different Frequencies and Types of *Dis+dys*fluencies

### 4.1.1 Thresholds of Judgment of Disfluencies and Stuttered Speech when Samples Contain Only Part-Word Repetitions (PWR)

### 4.1.2 Thresholds of Judgment of Disfluencies and Stuttered Speech when Samples Contain Only Whole Word Repetitions (WWR)

### 4.1.3 Thresholds of Judgment of Disfluencies and Stuttered Speech when Samples Contain Both PWR and WWR

### 4.1.4 Comparison Between MCWS and MCWNS

## 4.2 Threshold of Recommendation of Speech Therapy across Different Frequencies and Types of *Dis+dys*fluencies

## 4.3 Intra-Rater Reliability

## 4.1 Thresholds of Judgment of Disfluencies and Stuttering across Different Frequencies and Types of *Dis+dys*fluencies

Modal scores were compared between both groups (MCWS and MCWNS) for different types and frequencies of *dis+dys*fluencies to determine the threshold for tolerance of stuttered speech. The modal values for the judgment of samples across different frequencies and types of *dis+dys*fluencies are given in Table 4.1

**Table 4.1**

*Modal values for judgment of samples across different frequencies and types of dis+dysfluencies for MCWNS and MCWS.*

| | 1% (P) | | 3%(P) | | 5% (P) | | 7% (P) | | 10% (P) | | 15%(P) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MCWNS | MCWS | MCWNS | MCWS | MCWNS | MCWS | MCWNS | MCWS | MCWNS | MCWS | MCWNS | MCWS |
| PWR | 1(85%) | 1(70%) | 1(80%) | 1(55%) | 2(60%) | 2(60%) | 2(60%) | 2(45%) | 2(50%) | 3(50%) | 2(50%) | 3(70%) |
| WWR | 1(90%) | 1(80%) | 1(80%) | 1(45%) | 1(70%) | 2(70%) | 1(50%) | 2(70%) | 2(80%) | 3(50%) | 2(55%) | 3(50%) |
| Both | 1(90%) | 1(80%) | 1(70%) | 1(85%) | 1(60%) | 1(55%) | 2(55%) | 2(50%) | 2(45%) | 2(60%) | 2(45%) | 3(65%) |

*Note.* 1: Fluent, 2: Disfluent, 3: Stuttered, PWR: Part Word Repetition, WWR: Whole Word Repetition, Both: Including both PWR and WWR, MCWS: Mothers of children who stutter, MCWNS: Mothers of children who do not stutter, (P): Percentage of participants.

### *4.1.1 Thresholds of Judgment of Disfluencies and Stuttered Speech when Samples Contain Only Part-Word Repetitions (PWR)*

As depicted in Table 4.1, a modal score of 1 was obtained for 1% and 3% dis+*dys*fluent samples, indicating that the majority of the listeners rated the sample as 'fluent' in both groups. In the MCWNS group, 5%, 7%, 10%, and 15% samples had a score of 2, while 2 was the modal value observed only for 5% and 7% samples in the MCWS group, indicating that these samples were judged as disfluent. As shown in Figure 4.1, the samples containing more than 5% PWR up to 15% dis+*dys*fluencies evoked judgment of disfluency by the majority of listeners in the MCWNS group. In contrast, the modal value 3 was obtained for 10% and 15% samples, indicating that a lower threshold is needed for a sample to be judged as stuttered in the MCWS group. Further, Friedman's analysis of variance was done to find if there is any significant difference between different frequencies of dis+*dys*fluencies for both groups. As there was a significant difference in the MCWNS [$\chi^2$ (5) = 37.50, $p < 0.001$] and MCWS [$\chi^2$ (5) = 48.376, $p < 0.001$] groups, the separate Pairwise comparison was made, which revealed that there exists a significant difference for 1-7%, 1-10%, 1-15%, and 3-10% dysfluent sample in the MCWNS group and 1-7%, 1-10%, 1-15%, 3-10%, 3-15% and 5-10 % dysfluent sample in the MCWS group. Friedman test results are depicted in Table 4.2

**Figure 4.1**

*Thresholds of judgment for samples containing part-word repetition (PWR) across different frequencies for mothers of children who stutter (MCWS) and mothers of children who do not stutter (MCWNS).*

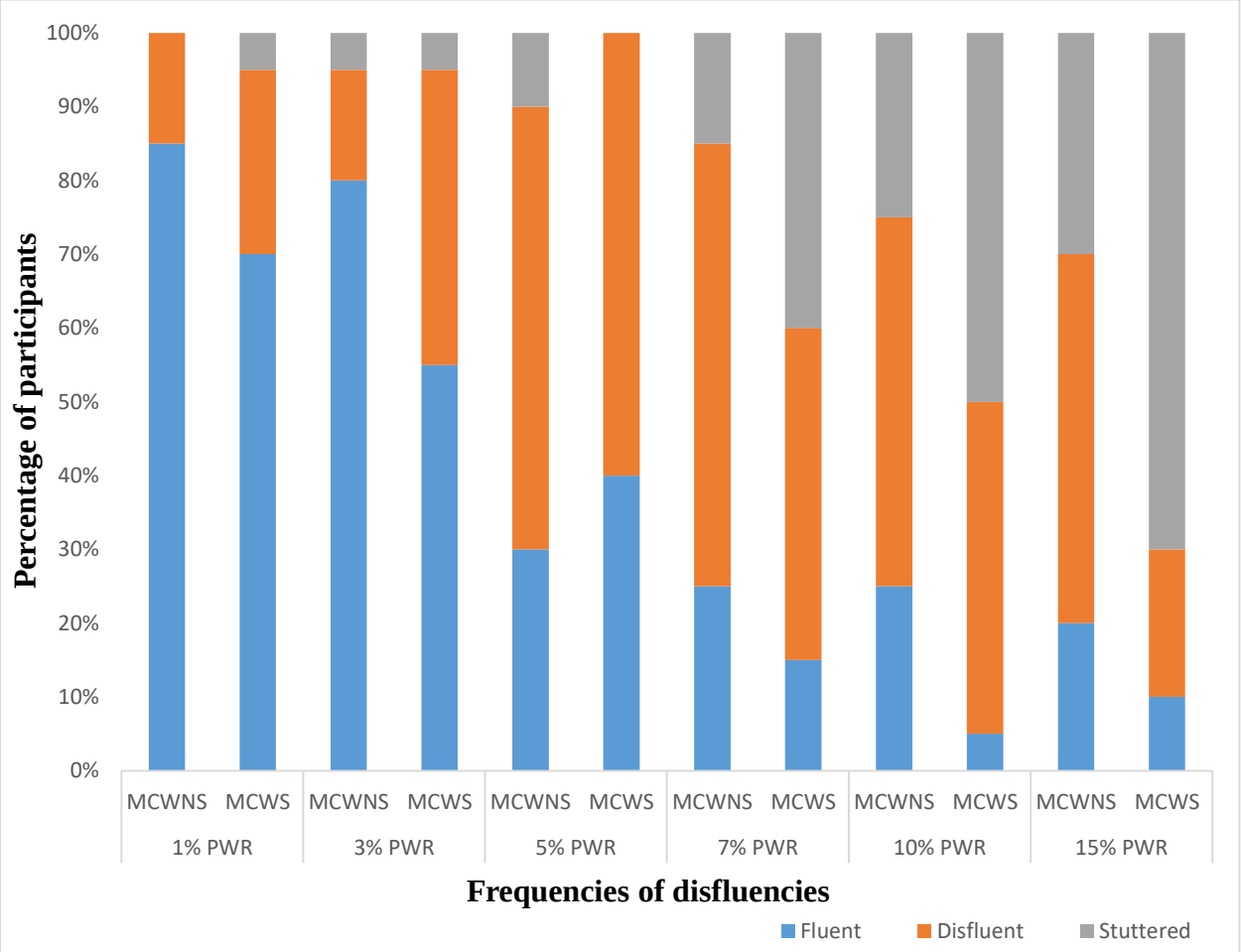


**Table 4.2**

*Pairwise comparison for the judgment of samples containing part-word repetition (PWR) across different frequencies using Friedman's two-way analysis of variance by ranks among MCWNS and MCWS.*

| Pair-wise comparison | MCWNS p-value | MCWS p-value |
|---|---|---|
| 1%-3% | 1.000 | 1.000 |
| 1%-5% | .079 | 1.000 |
| 1%-7% | .026* | .023* |
| 1%-10% | .005* | .001* |
| 1%-15% | .002* | .000* |
| 3%-5% | .214 | 1.000 |
| 3%-7% | .079 | .132 |
| 3%-10% | .017* | .006* |
| 3%-15% | .007 | .002* |
| 5%-7% | 1.000 | .377 |
| 5%-10% | 1.000 | .023* |
| 5%-15% | 1.000 | .007 |
| 7%-10% | 1.000 | 1.000 |
| 7%-15% | 1.000 | 1.000 |
| 10%-15% | 1.000 | 1.000 |

*Note.* MCWS: Mothers of children who stutter, MCWNS: Mothers of children who do not stutter

* $P<0.05$

### *4.1.2 Thresholds of Judgment of Disfluencies and Stuttered Speech when Samples Contain Only Whole Word Repetitions (WWR)*

The modal scores for different frequencies of dis+*dys*fluencies for WWR are tabulated in Table 4.1. In MCWNS, 1%, 3%, and 5% dysfluent samples had a modal score of 1, indicating a judgment of fluency, whereas 7%, 10%, and 15% samples had a score of 2, indicating a judgment of disfluency. On the other hand, in the MCWS group, the 1% and 3% samples had a score of 1. A modal value of 2 was obtained for 3% and 7% samples, and a modal score of 3 for 10% and 15% samples, suggesting a lower threshold when compared to the MCWNS group. Friedman's analysis of variance revealed significant differences between different frequencies of *dis*+dysfluencies for MCWNS [$\chi^2$ (5) = 34.399, $p < 0.001$] and MCWS [$\chi^2$ (5) = 48.653, $p < 0.001$]. As mentioned in Table 4.3, a pairwise comparison was made, which revealed that there exists a significant difference for 1-15%,1-10%, 3-15%, and 3-10% in the MCWS group, and for the 1-7%, 1-10%, 1-15%, 3-10%, and 3-15% samples in the MCWNS group.

**Figure 4.2**

*Thresholds of judgment for samples containing whole-word repetition (WWR) across different frequencies for MCWS and MCWNS*

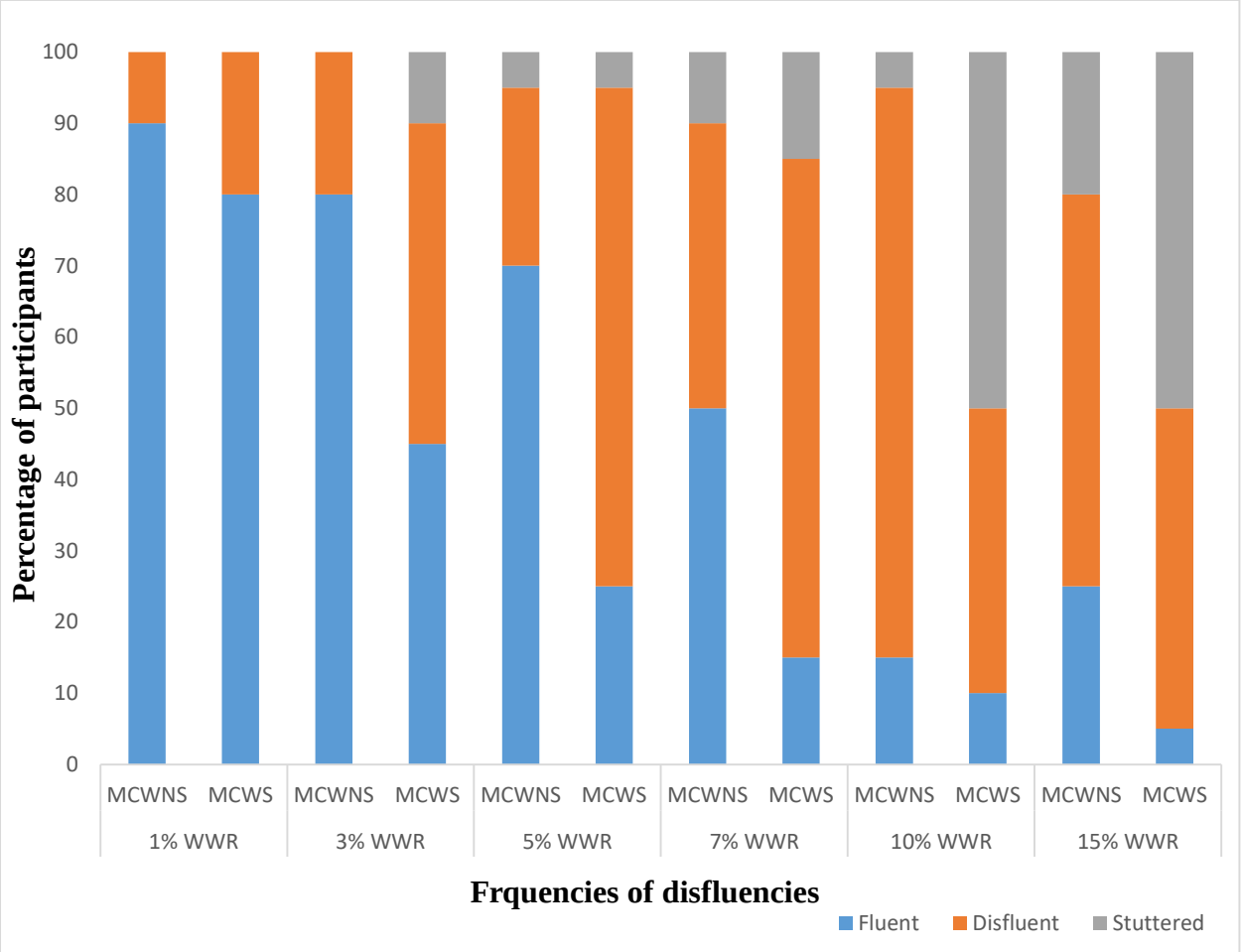


**Table 4.3**

*Pairwise comparison for the judgment of samples containing whole-word repetition (WWR) across different frequencies using Friedman's two-way analysis of variance by ranks among MCWNS and MCWS.*

| Pair-wise comparison | MCWNS p-value | MCWS p-value |
|---|---|---|
| 1%-3% | 1.000 | .945 |
| 1%-5% | 1.000 | .103 |
| 1%-7% | .576 | .013* |
| 1%-10% | .013* | .000* |
| 1%-15% | .003* | .000* |
| 3%-5% | 1.000 | 1.000 |
| 3%-7% | 1.000 | 1.000 |
| 3%-10% | .070 | .053* |
| 3%-15% | .020* | .020* |
| 5%-7% | 1.000 | 1.000 |
| 5%-10% | .302 | .576 |
| 5%-15% | .103 | .269 |
| 7%-10% | 1.000 | 1.000 |
| 7%-15% | 1.000 | 1.000 |
| 10%-15% | 1.000 | 1.000 |

*Note.* MCWS: Mothers of children who stutter, MCWNS: Mothers of children who do not stutter

* $P<0.05$

### *4.1.3 Thresholds of Judgment of Disfluencies and Stuttered Speech when Samples Contain Both PWR and WWR*

A modal score of 1 was obtained for 1%, 3%, and 5% dysfluent samples for both groups, indicating that these samples were judged as fluent. In the MCWNS group, 7%, 10%, and 15% samples scored 2, while 2 was the modal value for 7% and 10% samples in the MCWS group, suggesting that these samples were judged as disfluent. Both groups perceive the sample as disfluent at 7% and 10%, but a modal value of 3 was obtained for a 15% sample in the MCWS group, indicating a lower threshold for judging the sample as stuttered. Friedman's analysis of variance was done to find if there is any significant difference between different frequencies of *dis+dys*fluencies for both groups. As there was a significant difference in the MCWNS [$\chi^2$ (5) = 27.716, $p < 0.001$] and MCWS [$\chi^2$ (5) = 65.794, $p < 0.001$] groups, the pairwise comparison was made, which revealed that there exists a significant difference for 1-15% and 3-15% dysfluent samples when both PWR and WWR were included for MCWNS group and 3-10%, 3-15%, 1-10%, 1-15%, 5-10%, 5-15%, and 7-15% samples in MCWS group. Table 4.4 represents Friedman's value for both groups.

**Figure 4.3**

*Thresholds of judgment for samples containing both PWR and WWR across different frequencies for MCWS and MCWNS.*

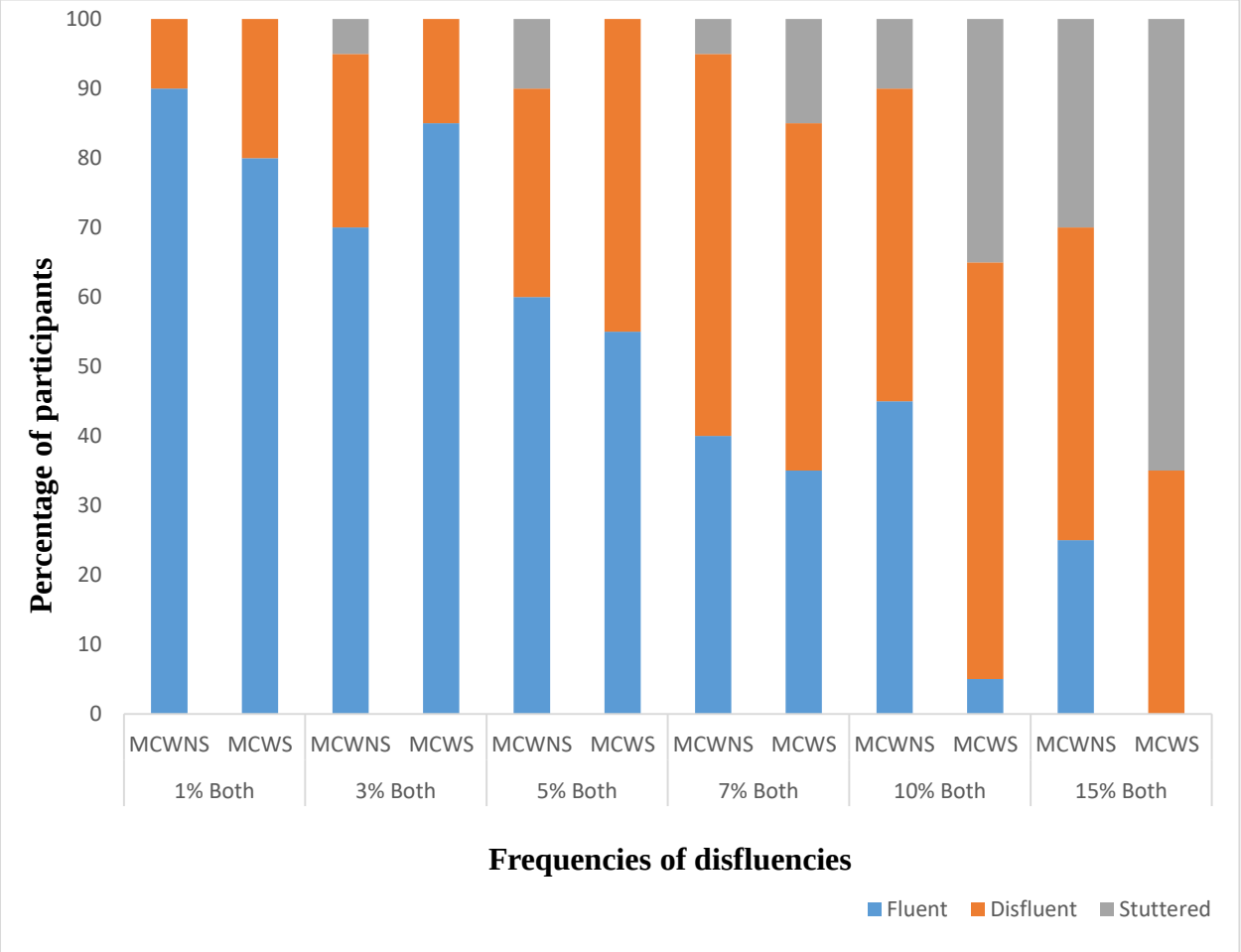


**Table 4.4**

*Pairwise comparison for the judgment of samples containing both PWR and WWR across different frequencies using Friedman's two-way analysis of variance by ranks among MCWNS and MCWS.*

| Pair-wise comparison | MCWNS | MCWS |
|---|---|---|
| | p-value | p-value |
| 1%-3% | 1.000 | 1.000 |
| 1%-5% | 1.000 | 1.000 |
| 1%-7% | .302 | .168 |
| 1%-10% | .214 | .000* |
| 1%-15% | .002 | .000* |
| 3%-5% | 1.000 | 1.000 |
| 3%-7% | 1.000 | .337 |
| 3%-10% | 1.000 | .000* |
| 3%-15% | .061 | .000* |
| 5%-7% | 1.000 | 1.000 |
| 5%-10% | 1.000 | .009 |
| 5%-15% | .467 | .000* |
| 7%-10% | 1.000 | .519 |
| 7%-15% | 1.000 | .040* |
| 10%-15% | 1.000 | 1.000 |

*Note.* MCWS: Mothers of children who stutter, MCWNS: Mothers of children who do not stutter

* $P<0.05$

### *4.1.4 Comparison Between MCWS and MCWNS.*

The chi-square test was used to find differences among different frequencies of *dis+dys*fluencies between both groups. It shows that there is a significant difference for the 15%[$\chi^2$ (2) = 6.438, p < 0.005] *dis+dys*fluent sample of PWR, the 3%[$\chi^2$ (2) = 5.883, p < 0.005] 5%[$\chi^2$ (2) = 8.526, p < 0.005] and 10% [$\chi^2$ (2) = 10.230, p < 0.005] sample of WWR, and the 10%[$\chi^2$ (2) = 9.606, p < 0.005] and 15%[$\chi^2$ (2) = 7.829, p < 0.005] samples when samples contain both PWR and WWR. Table 4.5 represents chi-square values.

**Table 4.5**

*Chi-square results of comparison between MCWNS and MCWNS for judgment of samples across different frequencies and types of dis+dys*fluencies.

| | 1% | | 3% | | 5% | | 7% | | 10% | | 15% | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $\chi^2$ | p-value | $\chi^2$ | p-value | $\chi^2$ | p-value | $\chi^2$ | p-value | $\chi^2$ | p-value | $\chi^2$ | p-value |
| PWR | 1.79 | .409 | 3.199 | .202 | 2.286 | .319 | 3.201 | .202 | 4.386 | .112 | 6.438 | 0.040* |
| WWR | .754 | .376 | 5.883 | .53 | 8.526 | 0.014* | 5.606 | 0.61 | 10.23 | .006* | 5.438 | .066 |
| Both | 0.764 | .376 | 1.79 | .409 | 2.64 | .267 | 1.14 | .573 | 9.606 | .008* | 7.829 | 0.020* |

*Note.* PWR: Part Word Repetition, WWR: Whole Word Repetition, Both: Including both PWR and WWR, MCWS: Mothers of children who stutter, MCWNS: Mothers of children who do not stutter

* $P<0.05$

## 4.2 Threshold of Recommendation of Speech Therapy across Different Frequencies and Types of *Dis+dys*fluencies

Modal scores were compared for responses to speech therapy recommendations between MCWS and MCWNS groups. A modal value of 2 was obtained in the MCWNS group for 1%, 3%, 5%, 7%, 10%, and 15% samples for all types of *dis+dys*fluencies, indicating that most participants did not recommend speech therapy. On the other side, a modal value of 2 was obtained for the 1%, 3%, and 5% for PWR 1%, 3%, 5%, and 7% samples for WWR and 1%, 3%, 5%, 7%, and 10% when samples contain both PWR and WWR. As depicted in Figure 4.4, Figure 4.5, and Figure 4.6, results reveal that in the MCWS group, a score of 1 indicates recommending speech therapy for the sample above 7% dis+*dys*fluencies in PWR, 10% for WWR, 10 % for a sample containing both PWR and WWR. This suggests that the MCWS recommends speech therapy as the percentage of *dis+dys*fluencies increases. The modal values are tabulated in Table 4.6

**Table 4.6**

*Modal values for the recommendation of speech therapy across different frequencies and types of dis+dysfluencies for MCWNS and MCWS.*

| | 1% therapy (P) | | 3% therapy (P) | | 5% therapy (P) | | 7% therapy (P) | | 10% therapy (P) | | 15% therapy (P) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MCWNS | MCWS | MCWNS | MCWS | MCWNS | MCWS | MCWNS | MCWS | MCWNS | MCWS | MCWNS | MCWS |
| PWR | 2(100%) | 2(85%) | 2(90%) | 2(85%) | 2(75%) | 2(80%) | 2(70%) | 1(60%) | 2(75%) | 1(75%) | 2(65%) | 1(95%) |
| WWR | 2(100%) | 2(100%) | 2(95%) | 2(85%) | 2(100%) | 2(75%) | 2(90%) | 2(65%) | 2(90%) | 1(70%) | 2(80%) | 1(85%) |
| Both | 2(100%) | 2(100%) | 2(95%) | 2(100%) | 2(75%) | 2(85%) | 2(85%) | 2(65%) | 2(90%) | 1(50%) | 2(60%) | 1(85%) |

*Note.* PWR: Part Word Repetition, WWR: Whole Word Repetition, Both: Including both PWR and WWR, MCWS: Mothers of children who stutter, MCWNS: Mothers of children who do not stutter, (P): Percentage

**Figure 4.4**

*Thresholds for recommendations of speech therapy across different frequencies when samples contain only PWR for MCWS and MCWNS*

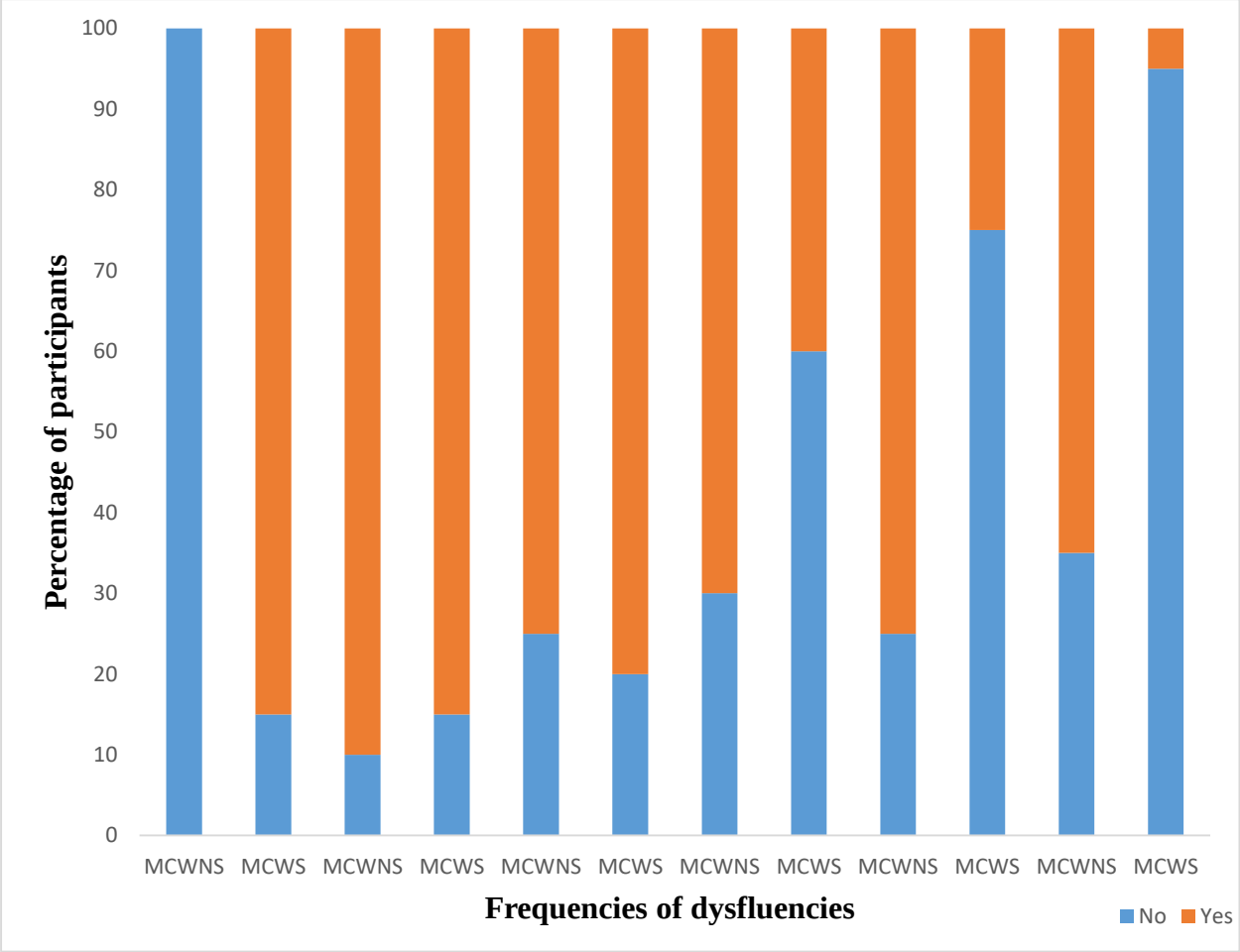


**Figure 4.5**

*Thresholds for recommendations of speech therapy across different frequencies when samples contain only WWR for MCWS and MCWNS*

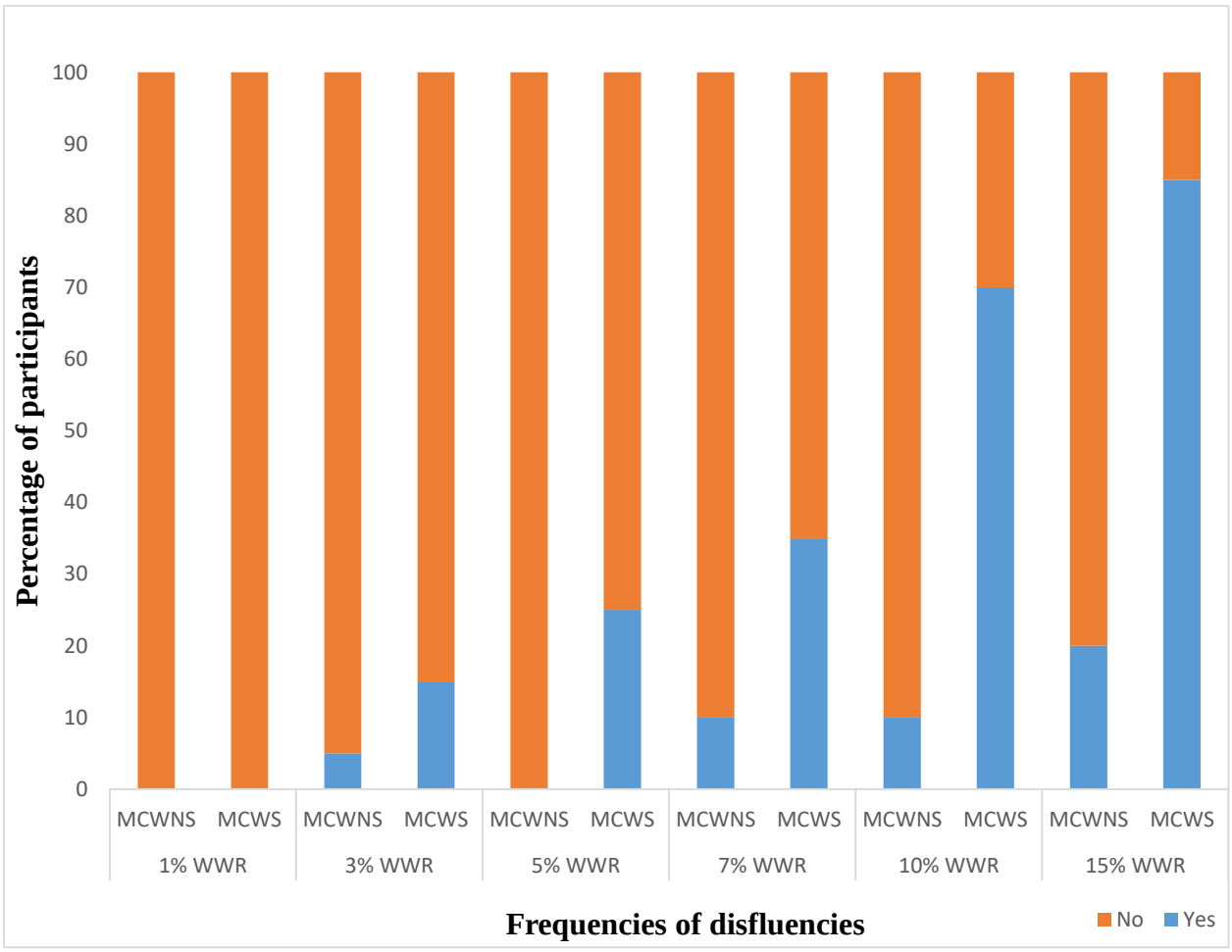
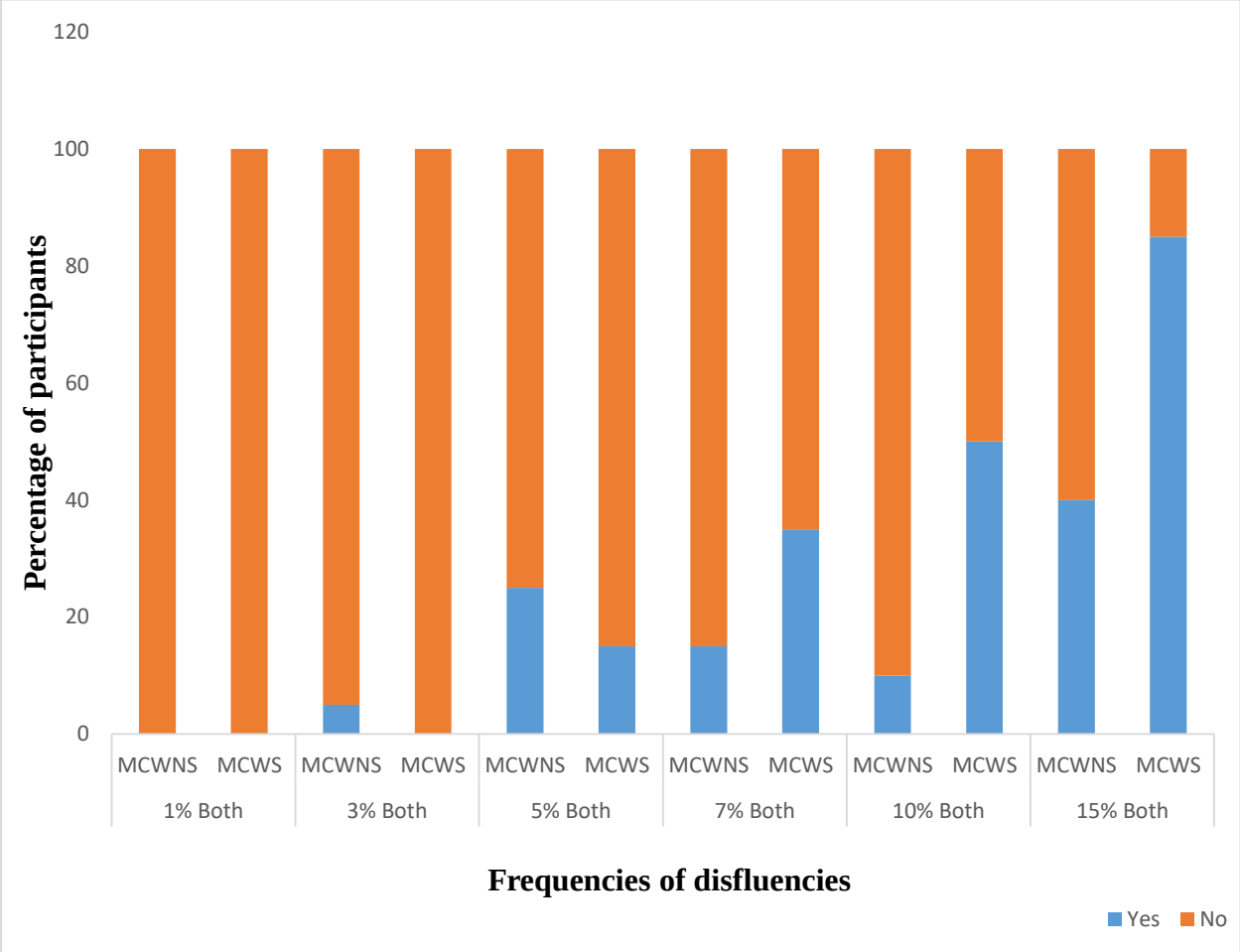


**Figure 4.6**

*Thresholds for recommendations for speech therapy across different frequencies when samples contain both PWR and WWR for MCWS and MCWNS*




The Cochrane Q test was used to find differences in responses to recommendations for speech therapy. As indicated in Table 4.7, there is a significant difference for PWR. When samples contain both PWR and WWR across different

frequencies in both groups, but there is not much of a significant difference in the MCWNS group for WWR. As there was a significant difference, a pair-wise comparison was made, and it revealed that there exists a significant difference when samples contain both PWR and WWR for 15-10%, 15-3%, and 15-1% dysfluent. On the other hand, there is a significant difference in the MCWS group for all types of dis+dysfluencies. As tabulated (Table 4.8, Table 4.9, Table 4.10) among PWR 1-10%, 1-15%, 3-10%, 3-15%, 5-10%, 5-15% samples were significantly different, and among WWR 15-7%, 15-5%, 15-3%, 15-1%, 10-3%, and 10-1% samples were significantly different when both PWR and WWR were included for 15-7%, 15-5%, 15-1%, 15-3%, 10-1%, and 10-3% samples differed significantly.

**Table 4.7**

*Cochrane's Q test results across different frequencies of dis+dysfluencies in MCWS and MCWNS.*

| | MCWNS | MCWS |
|---|---|---|
| PWR | [$\chi^2$ (5) = 11.742, p < 0.005] | [$\chi^2$ (5) = 53.235, p < 0.001] |
| WWR | [$\chi^2$ (5) = 8.415, p > 0.005] | [$\chi^2$ (5) = 45.493, p < 0.001] |
| Both PWR AND WWR | [$\chi^2$ (5) = 21.066, p < 0.001] | [$\chi^2$ (5) = 50.891 p < 0.001] |

*Note.* PWR: Part Word Repetition, WWR: Whole Word Repetition, Both PWR and WWR: Including both PWR and WWR, MCWS: Mothers of children who stutter, MCWNS: Mothers of children who do not stutter

**Table 4.8**

*Pairwise comparison for the responses to speech therapy across different frequencies for samples containing PWR using Cochrane's Q tests among MCWNS and MCWS.*

| Pair-wise comparison | P value | |
|---|---|---|
| | MCWNS | MCWS |
| 15% - 7% | P-value | .301 |
| 15% - 5% | 1.000 | .000* |
| 15% - 10% | 1.000 | 1.000 |
| 15% - 3% | 1.000 | .000* |
| 15% - 1% | .602 | .000* |
| 7% - 5% | .061 | .118 |
| 7% - 10% | 1.000 | 1.000 |
| 7% - 3% | 1.000 | .042* |
| 7% - 1% | 1.000 | 0.042* |
| 5% - 1% | .207 | 1.00 |
| 10% - 1% | .602 | .001* |
| 5% - 3% | .602 | 1.00 |

| | | |
|---|---|---|
| 10% - 3% | 1.000 | .001* |
| 5% - 10% | 1.000 | .004* |
| 3% - 1% | 1.000 | 1.00 |

*Note*. MCWS: Mothers of children who stutter, MCWNS: Mothers of children who do not stutter

* $P<0.05$

**Table 4.9**

*Pairwise comparison between the responses to speech therapy across different frequencies for samples containing WWR using Cochrane's Q tests for MCWS.*

| Pair-wise comparison | P value |
|---|---|
| 15% - 10% | 1.000 |
| 15% - 7% | .017* |
| 15% - 5% | .001* |
| 15% - 3% | .000* |
| 15% - 1% | .000* |
| 10% - 7% | .344 |
| 10% - 5% | .052* |

| | |
|---|---|
| 10% - 3% | .005 |
| 10% - 1% | .000* |
| 7% - 5% | 1.000 |
| 7% - 3% | 1.000 |
| 7% - 1% | .344 |
| 5% - 3% | 1.000 |
| 5% - 1% | 1.000 |
| 3% - 1% | 1.000 |

*Note*. MCWS: Mothers of children who stutter, MCWNS: Mothers of children who do not stutter

* $P<0.05$

**Table 4.10**

*Pairwise comparison between the responses to speech therapy across different frequencies when samples contain both PWR and WWR using Cochrane's Q tests among MCWNS and MCWS.*

| Pair-wise comparison | P value | |
|---|---|---|
| | MCWNS | MCWS |
| 15% - 5% | 1.000 | .000*. |
| 15% - 7% | .197 | .010* |
| 15% - 10% | .044* | .255 |
| 15% - 3% | .008 | .000* |
| 15% - 1% | .001 | .000* |
| 5% - 7% | 1.000 | 1.000 |
| 5% - 10% | 1.000 | .255 |
| 5% - 3% | .710 | 1.00 |
| 5% - 1% | .197 | 1.00 |
| 7% - 10% | 1.000 | 1.00 |
| 7% - 3% | 1.000 | .255 |

| | | |
|---|---|---|
| 7% - 1% | 1.000 | 1.00 |
| 10% - 3% | 1.000 | 0.10* |
| 10% - 1% | 1.000 | 0.10* |
| 3% - 1% | 1.000 | 1.00 |

*Note.* MCWS: Mothers of children who stutter, MCWNS: Mothers of children who do not stutter

* $P<0.05$

### *4.2.1 Comparison between MCWS and MCWNS for recommendation of speech therapy*

The chi-square test was used to find differences among different frequencies of *dis+dys*fluencies. There was a significant difference for 10% [$\chi^2$ (1) = 10.00, p < 0.005] and 15%[$\chi^2$ (1) = 15.824, p < 0.001] dysfluent samples of PWR, 5%[$\chi^2$ (1) = 5.714, p < 0.005], 10%[$\chi^2$ (1) = 15.00, p < 0.005], and 15% [$\chi^2$ (1) = 16.94, p < 0.005] dysfluent samples of WWR, and 10% [$\chi^2$ (1) = 7.619, p < 0.005] and 15% [$\chi^2$ (1) = 8.64, p < 0.005] dysfluent samples when both PWR and WWR are included. Table 4.11 depicts chi-square values.

**Table 4.11**

Chi-square results of comparison between MCWNS and MCWS for the recommendation of speech therapy across different frequencies and types of *dis+dys*fluencies.

| | 1% therapy | | 3% therapy | | 5% therapy | | 7% therapy | | 10% therapy | | 15% therapy | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $\chi^2$ | p-value | $\chi^2$ | p-value | $\chi^2$ | p-value | $\chi^2$ | p-value | $\chi^2$ | p-value | $\chi^2$ | p-value |
| PWR | 3.243 | .072 | 2.229 | .633 | .143 | .705 | 3.636 | 0.57 | 10 | 0.02* | 15.824 | <0.001** |
| WWR | - | ‡ | 1.111 | .292 | 5.714 | .017 | 3.584 | .058 | 15 | <0.001** | 16.942 | <0.001** |
| Both | - | ‡ | 1.026 | .311 | .625 | .429 | 2.133 | .144 | 7.619 | .006* | 8.640 | .003* |

*Note.* PWR: Part Word Repetition, WWR: Whole Word Repetition, Both: Including both PWR and WWR.

‡ No statistics are computed because the response to the 1% sample is a constant for PWR and WWR

* $P<0.05$ , ** $P<0.01$

### 4.3 Intra-judge reliability

For intra-judge reliability analysis, two mothers, each from MCWS and MCWNS, were randomly selected to judge all 18 speech samples for the second time, two weeks after the first judgment for intra-judge reliability. MCWNS had 0.492 reliability and 0.478 reliability, indicating weak agreement. For the recommendation of speech therapy, MCWNS had a perfect agreement (1.00), indicating no one recommended speech therapy, while Malayalam-speaking SLPs had 0.299 reliability, indicating minimal agreement

# Chapter V

# DISCUSSION

The present study investigated the perceptual thresholds of identifying stuttered speech in mothers of children who stutter (MCWS) and mothers of children who do not (MCWNS). The primary objectives were two-fold: first, to compare the perceptual thresholds of identifying stuttered speech, and second, to compare the perceptual thresholds for recommending a child to speech therapy between MCWS and MCWNS in speech samples with different frequencies and types of dis+dysfluencies. The discussion will be discussed under the following headings.

## 5.1 Threshold of Judgement of Disfluent and Stuttered Speech

5.1.1 Threshold of Judgement of Disfluent speech across types of *Dis+dys*fluencies.

5.1.2 Threshold of Judgement of Stuttered Speech across different types of *Dis+dys*fluencies.

5.1.3 Plateauing of Judgement of Stuttering with Increasing Frequency of *Dis+dys*fluencies.

## 5.2 Thresholds for Recommendation of Speech Therapy

*5*.2.1 Relation of the Threshold for Judgment of Disfluencies and/ or Stuttering with the Threshold for Recommendation of Therapy in MCWS

5.2.2 Therapy Recommendations for the Samples with Only WWR

5.2.3 Effect of types of disfluencies/dysfluencies on therapy recommendation.

## 5.1 Threshold for Judgement of Disfluencies and Stuttering

In the discussion below, 'threshold' is presented as the minimum frequency of *dis+dys*fluent sample (1%, 3%, 5%, 7%, 10%, and 15% *dis+dys*fluencies), at which a minimum of 50% of participants judged that sample to be disfluent/ stuttered.

### *5.1.1 Threshold for Judgement of Disfluencies across Types of Dis+dys*fluencies

The modal threshold for judgment of disfluencies was five percent for the sample containing only PWR, 10% for the sample containing only WWR, and seven percent for the sample containing both PWR and WWR when presented to MCWNS. In MCWS, the modal threshold for judgment of disfluencies was found to be five percent for the sample containing only PWR, five percent for the sample containing only WWR, and seven percent for the sample containing both PWR and WWR.

The results mentioned above clearly depict that the threshold for judgment of disfluencies was the lowest for the samples containing only PWR in both MCWS and MCWNS. It could be because PWR is a type of stuttering-like dysfluencies (SLDs) category and is observed more frequently in CWS than other disfluencies (ODs). Thus, PWR are more probable to be judged as disfluent than WWR. (Ram, 2013). This finding is also consistent with the results of Zebrowski and Conture (1989). They found that sound/ syllable repetitions were more likely to be judged as disfluent when compared to monosyllabic whole-word repetitions. Further, the 'Non-stuttering' type of disfluencies also evokes judgment of disfluency at higher frequencies. Similarly,

'stuttering-like' dysfluencies evoke the same at lower frequencies (Hegde et al., 1984, 1988, 1991.)

Also, the modal threshold for judgment of disfluencies in the sample containing only WWR was much lower in MCWS (five percent) than in MCWNS (10%). This implies that MCWS is more sensitive to the perception of disfluencies than MCWNS. Although the modal threshold for the judgment was five percent for samples containing only PWR and seven percent for samples containing both PWR and WWR in both MCWS and MCWNS, the judgment of disfluent speech was more frequently observed in MCWS than in MCWNS for lower severities. MCWS judged 40% of samples to be disfluent for the three percent severity sample containing only PWR, while MCWNS judged only 15% as disfluent. Similarly, for the five percent severity sample containing both PWR and WWR, MCWS judged 45% of samples to be disfluent, while MCWNS judged only 30% to be disfluent. This implies that MCWS are more sensitive in detection of disfluencies than MCWNS. A similar finding was reported by Bloodstein (1957), wherein he stated that parents of children who stutter have high expectations regarding fluency in their children's speech, thus making their ability to perceive disfluencies higher than the parents of children who do not stutter.

Another interesting finding of this study is that even WWR, which are regarded as normal non-fluencies or ODs at a higher frequency (>=10%), were judged as stuttering by MCWNS. A similar finding was reported by Hegde and Hartman (1979a,

1979b). They reported that WWR and interjections could be perceived as disfluencies or stuttering when presented at a severity of five to 15 percent.

### *5.1.2 Threshold for Judgement of Stuttered Speech across different types of disfluencies*

The modal threshold for the judgment of stuttering was found to be 10% for the sample containing only PWR, 10% for the sample containing only WWR, and 15% for the sample containing both PWR and WWR when presented to MCWS. On the other hand, the percentage of participants who judged the highest severity sample (15% disfluencies) to be stuttered was 30% (n=6) for the sample containing only PWR, 20% for the sample containing only WWR, and 30% for the sample containing both PWR and WWR in the MCWNS group. This shows that the sensitivity of judgment of stuttered speech is higher in MCWS than in MCWNS. Berlin (1957) discussed a similar finding. He reported that parents of children who stutter are more intolerant to the judgment of stuttering, i.e., they were more sensitive to judge someone to be a stutterer when compared to parents of children who do not stutter.

Johnson (1959) reported that parents of children who stutter tend to diagnose normal non-fluencies as stuttering more frequently than the parents of children who do not stutter. A similar result was found in the present study, wherein the threshold for judgment of stuttering for samples containing WWR was 10% in MCWS and 15% in MCWNS.

The results further reveal that the modal threshold for judgment of stuttered speech was higher for the sample containing both PWR and WWR (15%) than the ones containing only PWR (10%) or WWR (10%) when presented to MCWS. This could be because including samples with both WWR, which is considered ODs, and PWR, which is a SLDs, could have reduced the perception of stuttered speech.

### *5.1.3 Plateauing of Judgement of Stuttering with Increasing Frequency of Disfluencies*

Another phenomenon was observed in the results of this study. Increasing the severity of dis+dysfluencies beyond 10% did not significantly change the perception of the sample to be disfluent/ stuttered. The chi-square test also revealed a high degree of association ($p<0.05$) for 10% and 15% samples containing only PWR and the sample containing both PWR and WWR.

## 5.2 Thresholds for Recommendation of Speech Therapy

The modal threshold for a recommendation of therapy was found to be seven percent for the sample containing only PWR, 10% for the sample containing only WWR, and 10% for the sample containing both PWR and WWR when presented to MCWS. On the other hand, the percentage of participants who recommended therapy to the highest severity sample (15% dis+*dys*fluencies.) was 35% (n=7) for the sample containing only PWR, 20% for the sample containing only WWR, and 40% for the sample containing both PWR and WWR in the MCWNS group. This implies that MCWS are more intolerant to stuttering, thus recommending therapy at lower

thresholds than MCWNS. This is in line with the finding of Berlin (1957), who reported that parents of children who stutter were more intolerant to the diagnosis of stuttering than parents of children who do not. This also suggests that MCWNS are probably less aware of the speech characteristics (dis+dysfluencies) of individuals with stuttering, thus corresponding to fewer recommendations for therapy than the MCWS.

Hegde and Hartman (1979) found the threshold for therapy recommendation to be five percent disfluencies (WWR and Interjections). In contrast, it was found to be 10% for WWR when presented to MCWS and greater than 15% when given to MCWNS. This difference could have arisen because of the difference in the methodology used in both studies. The present study used a naturally dysfluent sample, using other samples of varying percentages of dis+dysfluencies to be created by trimming and copy-pasting the part of the original sample itself. In the study by Hegde and Hartman (1979), samples with varying dis+dysfluencies were created by instructing the speaker to simulate word repetitions at different frequencies across the six samples recorded. The latter methodology has higher chances of resulting in unnatural-sounding speech, where there is a higher probability of an even lesser percentage of dis+dysfluencies being perceived as more deviant than normal, thus prompting recommendations for speech therapy.

### *5.2.1 Relation of the Threshold for Judgment of Dysfluencies and/ or Stuttering with the Threshold for Recommendation of Therapy in MCWS*

The threshold for a recommendation of therapy for samples having only PWR was found to be seven percent (recommended by 60% of participants), which is higher than the threshold of the judgment of dis+*dys*fluencies. (five percent dis+*dys*fluencies.) but lower than the threshold for judgment of stuttering (10% dis+*dys*fluencies.). At this threshold for a therapy recommendation, 45% of MCWS judged the sample as disfluent, whereas another 40% of MCWS judged the sample to be a stutterer.

The threshold for recommendation of therapy when samples containing only WWR was found to be 10% (recommended by 70% of participants), which is the same as the threshold of the judgment of stuttering (10%) but higher than the threshold of the judgment of *dis*+dysfluencies. (five percent *dis*+dysfluencies.). At this threshold for therapy recommendation, 40% of MCWS judged the sample as disfluent, whereas another 50% of MCWS judged the sample to be a stutterer.

The threshold for the recommendation of therapy in the case of the sample having both PWR and WWR was found to be 10% (recommended by 50% of participants), which is higher than the threshold of the judgment of *dis*+*dys*fluencies. (seven percent *dis*+*dys*fluencies.) but lower than the threshold for judgment of stuttering (15% *dis*+*dys*fluencies.). At this threshold for a therapy recommendation, 60% of MCWS judged the sample as disfluent, whereas another 35% of MCWS judged the sample to be a stutterer.

The pattern for the threshold of the judgment of disfluency, stuttering, and recommendation of therapy in the case of the sample having only PWR and the sample having both PWR and WWR suggests that although an individual's speech might not be dysfluent enough to be labeled as stuttering but still could be deviant enough from the normal fluent speech to be considered for speech therapy.

### *5.2.2 Therapy recommendations for the sample with only WWR*

Although WWR is considered to be amongst normal non-fluencies, at least 20% of the MCWS and 20% of the MCWNS recommended speech therapy for the sample, with only WWR at 10% disfluencies and 15% disfluencies, respectively. This suggests that normal fluencies at higher frequencies could be judged to be as disfluent or stuttered by nearly 20% of the mothers. This is in line with the finding reported by Hegde and Hartman (1979) that 'non-stuttering' types of disfluencies at a higher frequency range tend to be recommended for speech therapy services. However, the more significant number of mothers in the present study does not seem to recommend therapy due to better social acceptance of normal non-fluencies than SLDs. One possible explanation for this could be that both children who stutter and those who do not stutter exhibit ODs (Ram, 2013).

### *5.2.3 Effect of Types of Dis+dys***fluencies** *on Therapy Recommendation*

The threshold for therapy recommendation was lowest for the sample having only PWR (7%), followed by the sample having WWR (10%) and a sample containing both PWR and WWR (10%) by the MCWS. Similarly, more participants recommended

therapy at 15% severity of dis+*dys*fluencies. For the sample with only PWR (35% participants) than for the sample with only WWR (20%) by MCWNS. These findings suggest that PWR needs a lesser threshold for speech therapy than WWR. This is per the findings reported by Zebrowski and Conture (1989) that it is not only the percentage of *dis+dys*fluencies but also the types of *dis+dys*fluencies that matter in the judgment of stuttering.

**Conclusion**

PWR had the lowest threshold for being identified as stuttered/ disfluent speech in both groups. Moreover, the judgment of the presence of stuttering doesn't change when the percentage of *dis+dys*fluencies. is increased beyond a certain percentage of dysfluency (found to be 10% in the present study). Additionally, normal non-fluencies, or other dysfluencies, tend to be judged as stuttering when present in the higher frequency range. Both percentage and type of *dis+dys*fluencies influence the judgment of stuttering. Furthermore, MCWS had higher sensitivity for judgment of *dis+dys*fluencies and stuttering than MCWNS.

PWR had higher therapy recommendations than WWR at the same frequency levels by both MCWS and MCWNS. Moreover, normal non-fluencies or other disfluencies tend to be recommended for therapy when present in a higher frequency range, especially by MCWNS. Although an individual's speech might not be dysfluent enough to be labeled as stuttering, it still could be deviant enough from normal fluent speech to be considered for speech therapy. Additionally, most MCWNS did not recommend

therapy, even up to 15% of the disfluencies for either type of *dis+dys*fluency considered in the present study. In contrast, MCWS recommended therapy for thresholds higher than 7% across the *dis+dys*fluencies considered. Furthermore, both frequency and type of *dis+dys*fluencies influence the recommendation for speech therapy.

# Chapter VI

## SUMMARY AND CONCLUSIONS

The study explored the parental perception of stuttering with different frequencies and types of *dis+dys*fluencies. A single stuttered sample was modified to create 18 samples with different frequencies and types of *dis+dys*fluencies. Six samples with part-word repetitions (PWR) alone, six samples with whole-word repetitions (WWR) alone, and six samples including both PWR and WWR were created across different frequencies of *dis+dys*fluencies (1%, 3%, 5%, 7%, 10%, and 15%). All the samples were randomly presented to 20 mothers of children who do not stutter (MCWNS) and 20 who stutter (MCWS). Participants were asked to judge whether the sample was fluent, disfluent, or stuttered and had to recommend speech therapy if it was stuttered or disfluent. The principal finding was that there were significant differences across the different types of *dis+dys*fluencies between both groups. Among different types of *dis+dys*fluencies, both MCWS and MCWNS judged PWR to be stuttered at a lower frequency, followed by when samples contained both PWR and WWR and then WWR alone. A similar trend was observed in responses to recommendations for speech therapy. To conclude, a differential threshold exists for different types of *dis+dys*fluencies across frequencies of disfluencies/dysfluencies. MCWS are more inclined towards the judgment of *dis+dys*fluencies than MCWNS. Both frequency and types of *dis+dys*fluencies matter for a judgment to be fluent, disfluent, or stutter.

**Limitations**

- The study's findings are limited to a small size and thus may not represent the broader population.
- Participants were asked to judge 18 samples consecutively, which could have led to difficulty in concentration and affected the judgment of the samples
- Participants included only mothers of children who stutter and mothers of children who do not stutter
- Other external factors, such as prior exposure to speech therapy and knowledge of the treatment of stuttering, could also have influenced the judgments

**Clinical implications**

- The present study shows how listeners perceive and react to various frequencies of SLDs and ODs.
- The study's findings have improved the present knowledge about parental judgment about stuttering, which, in turn, will help create awareness about stuttering. Thus, it can lead to early identification and avoid misdiagnosis.
- The study determined the parent's threshold when the sample contains different types and frequencies of *dis+dys*fluencies and shed light on the presumed distinction between SLD and OD. The findings also underscore a need to distinguish normal non-fluencies at higher frequency ranges.

**Future research**

- Further studies with larger samples and robust experimental design, such as by including different types of *dis+dys*fluencies with various populations such as caregivers, teachers could expand upon the results.
- Consideration of other factors such as duration of therapy, characteristics of stuttering during the onset of stuttering, and the time gap between the onset of stuttering and judgment of samples could be better controlled for a better understanding.
- Further studies may investigate the effect of no. of iterations and duration of prolongation on judgment of stuttering.
- Future studies can include audio and audio-visual modes of presentation and different speech samples, such as spontaneous speech and oral reading, to study the perception of stuttering.
- Further conducting long-term studies, such as evaluating the changes in judgment after the training program, could lead to a better understanding.

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## APPENDIX I

1. ನೀವು ಕೇಳಿದ ರೆಕಾರ್ಡಿಂಗ್ / ಧ್ವನಿ ಮುದ್ರಣದಲ್ಲಿ ಮಗು ಹೇಗೆ ಮಾತನಾಡುತ್ತಿದ್ದಾನೆ ?

    a. ಆರಾಮಾಗಿ ಮಾತನಾಡುತ್ತಿದ್ದಾನೆ.

    b. ಬೆಳವಣಿಗೆ ಸಮಯದಲ್ಲಿ ಬರುವ ತೊದಲುವಿಕೆ/ಉಗ್ಗುವಿಕೆ ಇದೆ.

    c. ಮಗುವಿಗೆ ತೊದಲುವ ಸಮಸ್ಯೆ ಅಥವಾ ಉಗ್ಗುವಿಕೆ ಇದೆ.

2. ಮಗುವಿಗೆ ಸಾಮಾನ್ಯ ಬೆಳವಣಿಗೆಯ ತೊದಲುವಿಕೆ ಅಥವಾ ತೊದಲುವಿಕೆ (ಉಗ್ಗುವಿಕೆ) ಸಮಸ್ಯೆ ಇದ್ದಲ್ಲಿ , ಈ ಮಗುವಿಗೆ ಮಾತಿನ ತರಬೇತಿಯ ಅವಶ್ಯಕತೆ ಇದೆಯಾ ?

    a. ಹೌದು

    b. ಇಲ್ಲ