THERAPEUTIC MODULE FOR REHABILITATION OF CHILDREN WITH STUTTERING: ASSISTIVE STUTTERING INTERFACE- CHILDREN

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July 2020

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Certificate

This is to certify that this dissertation entitled **"Therapeutic module for rehabilitation of children with stuttering: Assistive Stuttering Interface-Children"** is a bonafide work submitted in part fulfillment for the degree of Master of Science (Speech-Language Pathology) by the student holding Registration Number 18SLP023. This has been carried out under the guidance of a faculty member of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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This is to certify that this dissertation entitled **"Therapeutic module for rehabilitation of children with stuttering: Assistive Stuttering Interface-Children"** has been carried out under my supervision and guidance. It is also certified that this dissertation 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 "**Therapeutic module for rehabilitation of children with stuttering: Assistive Stuttering Interface-Children**" is the result of my own study under the guidance of Dr. Anjana B. Ram, Assistant Professor, Department of Speech-Language Pathology, All India Institute of Speech and Hearing, Mysuru, and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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''The more knowledge you have, the more you're free to rely on your instincts''.

-Arnold Schwarzenegger

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Chapter 1

Introduction

One of the critical aspects of speech production is said to be "fluency." It refers to the continuity, rate, smoothness, and effort. Rhythm and rate of speech are often affected due to disruption in the flow of speech often marked by repetitions of sounds, syllables, words and/or phrases; prolongations; blocks; revisions and interjections. Whenever such disruptions occur, it is called fluency disorder or otherwise as "Stuttering." Secondary behaviors, negative reactions, tension, avoidance of particular sounds, words, and/or situations often co-occur with the dysfluent speech (J. S. Yaruss, 1998; J. Scott Yaruss & Quesal, 2004).

Persons with stuttering may experience a substantial amount of negative self-perception, stigma related to self, and others w.r.to their way of speaking. According to Smith and Weber, 2016, and Yairi and Ambrose, 1999, around 20%–25% of stuttering cases outgrow into adulthood. Support from speech-language pathologists (SLPs), allied health professionals, and other concerned people, plays a vital role in coping with stuttering.

Stuttering is a complex clinical problem that presents as a multi-faceted issue to the clinician, parents, and teachers of the persons who stutter and to the person with stuttering himself. First, there is a motor disruption evident in the abnormal types and frequency of dysfluent speech. There is a complex set of associations between the motor disturbance, the emotional attributes of the disorder, and further variations in the speech behavior. As these aspects of the disorder depend on each other, there is a severe disturbance in the individual's social functioning that can hamper many aspects of his life (Bloodstein, 1960).

However, for an individual to be considered having stuttering, following signs and experiences are usually part of the case history:

a) Stuttering is a childhood disorder. It is developmental, and the path it takes is foreseen (Bloodstein, 1960).

b) Initially, the pattern of dysfluency is episodic but eventually becomes long-standing.

c) Most parents or clients cannot mention any specific set of identifiable instances closely associated with the disorder's onset.

d) Historically, more consideration has been given to an adult with stuttering than the young child with dysfluency. Such a state of affairs is equitable from one perspective, but paradoxical from another. It is justifiable because the segments related to the normal nonfluencies occurring during childhood and the "actual" stuttering are theoretically and clinically ambiguous.

A remarkable effect on the quality of life can be seen in both adults and children with communication disorders. Several challenges are faced by the speech-language pathologists (SLPs) while delivering assessment and therapeutic services to such individuals. Some of the challenges include facilitating fair and impartial access to aids and services and rendering suitable treatment in a changing socio-economic context.

Employing telepractice has been one of the ways through which clinicians are removing barriers for delivering appropriate services. "Telepractice involves the use of communication technology to provide services through means other than in-person delivery models (Lowe et al. 2013)."

Telerehabilitation can be successfully used to deliver services at home or the local community using videoconferencing and computer-based modules. It can facilitate maintenance and generalization of treatment outcomes in various everyday situations of a person and regularly monitor communication behaviors. Various speech and language disorders in adults, including stuttering, laryngectomy, dysphagia, voice disorders, speech, and language disorders in children, have been intervened using image-based telerehabilitation applications.

It is essential to develop such applications and computer-based modules to make telerehabilitation an integral element of SLP practice (Theodoros, 2008).

Need for the study

To provide management for persons with stuttering requires enormous clinical experience and skill training. As both overt and covert behaviors characterize the disorder, it is essential to cater to both aspects while providing therapy. With the existing therapeutic materials and aids in clinical services, the usage of those materials has been minimal.

In order to provide a comprehensive management strategy for persons with stuttering, it is crucial to know the various treatment procedures, to be able to explain and demonstrate various techniques, to be able to justify the rationale behind the usage of each technique, to be able to choose and practice different activities at various phases and also, most importantly, to document the progress.

The use of telepractice to provide rehabilitation for persons with stuttering is not explored much. Using a computer-based module, for providing therapeutic services is beneficial for both professionals as well as clients. The professionals can use the module to provide information regarding the mechanism of fluent speech,

how dysfluent speech is different from fluent speech and orientation regarding the treatment procedures. This module can also further help the clinician demonstrate the techniques, provide feedback to the clients in real-time, and document the progress. The clients will be given better opportunities for gaining insight into various aspects of stuttering, know more about the disorder, to be able to practice the techniques and to self-monitor.

Hence the present study is planned to develop a computer-based module program that provides facilities such as overview on stuttering, demonstration of various techniques and analogies, feedback system, and documentation of progress.

Aim

The current research aims to develop a computer-based module for the rehabilitation of children with stuttering (CWS) between 5-15 years of age.

Objectives

1. To develop a computer-based module that provides various facilities that are useful in the management of CWS.

2. To orient clinical practitioners of SLP regarding the use of telepractice in the rehabilitation of CWS.

Chapter 2

Review of Literature

Many researchers have defined stuttering disorder from various perspectives. Most of them emphasize on its visible/overt characteristic features such as repetitions, prolongations, and blocks that usually characterizes the dysfluent speech (stuttering like dysfluencies) whereas, the crux of other definitions includes speaker's perspective and the reactions of persons with stuttering to his/her stuttering problem.

According to (Guitar, 2006), "any abnormal frequent disruption that may include repetitions (phoneme, syllable, or word), prolongations and/or blocks is referred to as stuttering."

One of the comprehensive definitions was proposed by (Wingate M. E., 1964). He defined "Stuttering as 1. (a) Disruption in the fluency of verbal expression, which is (b) characterized by involuntary, audible or silent, repetitions or prolongations, namely: sounds, syllables, and words of one syllable. (c) Usually these disruptions occur frequently or are marked in character and (d) are not readily controllable. 2. The disruptions are sometimes (e) accompanied by accessory activities involving the speech apparatus, related or unrelated body structures, or stereotyped speech utterances. 3. Also, there are no infrequent (f) indications or report of the presence of an emotional state, ranging from a general condition of 'excitement' or 'tension' to more specific emotions of a negative nature such as fear, embarrassment, irritation, or the like. (g) Some incoordination expressed in the peripheral speech mechanism is the immediate source causing stuttering".

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

Van Riper, 1982 stated that "stuttering occurs when the forward flow of speech is interrupted by a motorically disrupted sound, syllable, or word, or by the speaker's reactions thereto". According to him, speech is produced inappropriately in time and includes the reaction of an individual towards his or her stuttering. Thus, there is difficulty in speech planning, patterning, coordination, and the reaction of the person who stutters toward his or her speech impediment.

Tanner et al. (1995) defined stuttering, as "any condition where an individual improperly patterns phonemes, syllables, words and/or phrases in time, experiences classically- conditioned negative emotional reactions to disfluent speech and associated stimuli, and who may engage in visible avoidance or escape behaviors when confronted with disfluent speech or associated stimuli" considering both primary and secondary features of the same.

2.1 Stuttering in Children

Stuttering most often begins in childhood. Stuttering may be seen in children of around 2 ½ years of age (Ehud Yairi & Ambrose, 2005; J. S. Yaruss, 1998). Studies indicate that 95% of children develop stuttering before the age of five (Ehud Yairi & Ambrose, 2005).

Children with stuttering (CWS) usually present with disfluencies like hesitations, such as silent pauses and interjections of word fillers (e.g., "The color is like green") and nonword fillers (e.g., "The color is uh green"). Other examples include whole-word repetitions (e.g., "But-but I don't want to come") and phrase

repetitions or revisions (e.g., "This is a- this is a problem"). These are generally referred to as nonstuttered (typical) disfluencies (Tumanova et al., 2014; Ehud Yairi & Ambrose, 1999a). Differential diagnosis is a must to distinguish stuttering from avoidance, and language disorder, especially when the number of nonstuttered (typical) disfluencies are increased.

According to Yairi, 2007, stuttering-like disfluencies include part word or sound/syllable repetitions (e.g., "Look at the b-b baby"), prolongations (e.g., "Ssssssssometimes we stay home"), and blocks (i.e., inaudible or silent fixations or inability to initiate sounds). Additionally, stuttering-like disfluencies are generally accompanied by increased duration, effort, tension, or struggle.

Not all disfluencies outgrow into stuttering in adulthood. Some young children pass through a phase of excessive disfluency that may not persist in most children. Estimates of remission vary from 6.3% (Reilly et al., 2013) to 47% (Fritzell, 1976) to 89% (E. Yairi et al., 1996; Ehud Yairi & Ambrose, 1999b). The variability observed in recovery estimates may be attributed to factors such as the method adopted for data collection and the age at which recovery was determined (Reilly et al., 2013).

Stuttering disorder significantly interferes with school, work, and social interactions (J. Scott Yaruss & Quesal, 2004). Children who stutter may feel anxious, frustrated or embarrassed about speaking. This is also associated with negative reactions due to the effort and time required to speak (Ezrati-Vinacour et al., 2001). Children who stutter may also be at risk of experiencing bullying Greater risk of experiencing bullying may be seen in children who stutter (Blood & Blood, 2004; Davis et al., 2002).

2.1.1 Stuttering in Preschool Children

Young children may or may not communicate their reactions to stuttering. Reactions like avoidance of certain sounds/words or speaking situations, the emergence of secondary behaviors, increase in physical tension, reduction in the length of an utterance spoken, or changes in vocal parameters during moments of stuttering may be observed. To help the child minimize the progression of negative reactions to the disfluent speech, it is crucial that the parents and clinicians understand, acknowledge, and respond to the child's verbal and nonverbal behaviors in a supportive manner.

2.1.2 Stuttering in School-Aged Children and Adolescents

School-aged children typically between 6-13 years, have two major characteristics. Firstly, he/she starts to fear stuttering and secondly, the child reacts to the same by appearing to avoid it. These symptoms gradually develop as the child experiences negative emotions more frequently during stuttering. Increase in the tensed blocks, repetitions and prolongations can be observed due to increase in the tension resulting from feelings of frustration, fear and helplessness. With the increase in fear and anticipation of bad experiences, the child develops avoidance behaviors in addition to the escape behaviors that he/she is already using.

A speech-associated negative attitude in individuals who stutter is reported to be present at a young age. (Smith & Weber, 2016) concluded that anxiety problems are more likely to be experienced by school-age children and adolescents who stutter than their typically-developing peers. Goodman et al. (2010) also reported multiple peer problems faced by children who stutter, such as rejection, teasing, and bullying. Peer problems in childhood may lead to other mental

difficulties in adulthood (Lereya, et al, 2015). Experiences of teasing and bullying may develop feelings of shame and embarrassment that leads to social anxiety in children (Iverach & Rapee, 2014).

Individuals who have outgrown stuttering into their adolescence have a deeply ingrained pattern of stuttering behaviors. Often, they may take a back seat due to stuttering in situations such as avoid talking in class, and/or limit their social activities.

Core behaviors include repetitions, prolongations and blocks that is distinctly associated with struggle and tension. Blocks maybe associated with tremors of lips, jaw or tongue. Articulatory fixations may also be apparent in adolescents with stuttering. Avoidance behaviors are extensively observed such as appearing to think just before producing them, so that the listener's attention is diverted from their stuttering. Emotions of fear, shame and embarrassment are strong as they are conditioned over years. Individual may have negative feelings about self and feel that he/she is helpless and inept when stuttering occurs. This in turn affects the perception of the CWS to the listener's reaction.

2.2 Normal Non-Fluency

The developmental period of 2-6 years is very important as children are in the phase of language learning and communication development. During this period, they are mastering the adult forms of language and their speech tends to exhibit disfluencies. As children progress through different stages of language development, greater disfluencies may be observed at certain times than others. Also, these disfluency are a normal occurrence during developmental phase. These disfluencies are referred to as normal non-fluency (NNF).

Various hypotheses are put forth regarding NNF and stuttering. Stuttering and NNF are thought to lie on a continuum (Bloodstein, 1981; Starkweather, 1992). Normal disfluencies tend to outgrow as stuttering. It is simply a more severe and frequent manifestation of former. NNF during early childhood change over time and evolve into tense utterances and fragmentation of words that are perceived by listeners as dysfluent or stuttering due to the presence of abnormal reactions of listeners & himself (child). Johnson (1942) expanded this concept and created "*Diagnosogenic theory of stuttering***".** He hypothesized that both word and part word repetitions were prevalent in all children, and the development of stuttering occurs due to "*parents mislabeling of normal disfluency*" as stuttering. There would be considerable overlap in the nature of speech. Other perspective points to NNF and stuttering to be different w.r.to their characteristics. Yairi and Clifton (1972) and Silverman (1972b) observed disrhythmic phonation and tense pauses to occur least frequently in normal disfluent speakers Both the groups are categorically different (Yairi & Ambrose, 2005), athough considerable overlap of surface features exist in both groups, core features (helplessness, lack of control) is mostly seen in stuttering

Normal disfluencies usually include whole words and phrases repetitions, with interjections of "uh", "er", "ah", that are usually absent in stuttering. Stuttering is characterized by repetitions, prolongations and tense blocks along with dysrhythmic phonation. Secondary behaviors are usually not seen in NNF but is evident in stuttering.

Most children leave behind the disfluencies as they master adult communication, also that this stage is transitional. There is no need for therapeutic intervention for these children. However, children who go beyond simple repetitions and interjections to prolongation of sounds with signs of physical struggle while

producing speech may be “incipient stutterers”. You may see that, these children begin to repeat parts of words rather than the whole words and the frequency and duration of these disfluent episodes rise past normal expectations. Normally fluent speech is not effortful and the rhythm and rate don’t call attention to themselves.

2.3 Assessment of stuttering in children

A comprehensive assessment is done by a speech-language pathologist (SLP) for children reporting of fluency disorders. The assessment is individualized and carried out holistically in the communicative environment, focusing on various domains such as behavioral, cognitive, affective, and others that are known to co-occur fluency disorders. A speech and language assessment is warranted when any of the following are observed along with disfluencies (Guitar, 2013; Yaruss et al., 1998).

a. A positive family history of stuttering
b. Presence of any negative reactions towards the disfluency
c. Increased physical tension or secondary behaviors such as eye blinking, head nodding
d. Concerns regarding other speech-language skills
e. Experiences of negative reactions from significant others
f. Difficulty in communicating effectively
g. There is parental concern.

Protocols for assessment in children that are widely used include, Stuttering Severity Instrument Fourth Edition (SSI-4), Stuttering Prediction Instrument (SPI), and The Communication Attitude Test (CAT).

The fourth edition of the Stuttering Severity Instrument (SSI-4; Riley, 2009) is used for CWS aged 2-10 and older. It allows quick and effective quantification of the amount and degree of stuttering. Four domains are assessed to measure the severity of stuttering. They include:

i. Frequency of dysfluencies: Measured in percentage of syllables stuttered and converted to scores ranging from 2 to 18.
ii. Duration of dysfluencies: The average duration of the three longest stuttering moments converted to scores ranging from 2 to 18.
iii. Physical Concomitants: Facial grimaces, head movements, distracting sounds, and movement of extremities, expressed as scores ranging from 0 to 20.
iv. Speech Naturalness Rating.

Stuttering Prediction Instrument (SPI; Riley, 1981) is administered on children aged 3 to 8 years. It measures the severity of stuttering determining clinical history and reactions, prolongations, part-word repetitions, and frequency of dysfluencies. The percentile ranks and severity ratings are obtained as scores.

The Communication Attitude Test (CAT; Brutten, 1985) is an attitude rating scale, administered for school-age children and adolescents. It is a questionnaire containing 35 items to assess the speech-associated beliefs of CWS.

2.4 Treatment for Children with Stuttering

Treatment for fluency disorders is individual-specific and depends on a thorough assessment of speech, emotions and attitudes, and quality of life. While planning a treatment program, materials/ stimuli chosen must be linguistically and culturally appropriate. Also, it should be sensitive to the values and preferences of each individual/family. The clinician must consider the extent to which the child's disfluencies are hindering their overall communication. Better outcomes can be derived when a team approach is used in treatment planning and when the family preferences are taken into consideration. Continuous assessment is required to ensure that the treatment is just suitable for the changing experiences of the child and family during the treatment process.

2.4.1 Treatment Approaches for Preschool Children with Stuttering

Various treatment methods are employed to treat preschool children with stuttering. They are:

Indirect Approaches

Indirect treatment aims to provide counseling for family members on ways to modify their own speech and speaking environment of the child, such as reducing the speaking rate, not interrupting when the child is speaking, and supplying words /rephrasing to model fluent production. These changes are used to aid in fluent speech production (Millard et al., 2008; Yaruss et al., 2006).

Direct Approaches

Direct treatment involves modifying a child's speech to help in fluent productions. Treatment approaches include speech modification and stuttering

modification strategies that help to reduce dysfluencies, physical tension, and secondary behaviors (Hill, 2003). Direct treatment also targets ways to improve a child's communication attitudes (Yaruss et al., 2006).

Operant Approaches

The operant approaches utilize operant conditioning and practice response contingency principles to reinforce the child for fluent speech production and redirect disfluent speech. It also involves parent training to provide verbal contingencies based on the child's productions (Jones et al., 2005; Onslow et al., 2003). Positive reinforcement is given to encourage fluent production (the desired behavior) of the child. Operant procedures work within a framework of stuttering managed as a learned behavior (Conture, 2001; Onslow & Yaruss, 2007).

Stuttering therapy should not only focus on the peripheral-level impairment (disfluency), but also on the communicative experience of the child who stutters while considering the personal and environmental context, and activities of daily living. Clinicians must be knowledgeable and trained competently to provide treatment. Also, treatment approaches must be chosen based on the needs of the individual client within the context of the family and community.

2.4.2 Treatment Approaches for School-Aged Children and Adolescents with Stuttering

Treatment approaches for children and adolescents with stuttering may differ. While providing therapy, clinicians make use of integrated approaches to achieve optimal outcomes. All the approaches must include a plan for generalization and maintenance of skills associated with daily living activities.

Initially, the primary purpose of commencing therapeutic services is to eliminate or decrease the frequency of disfluencies. The clinician must recognize the overall impact on the child's communication and life as a whole and counsel the family members to know this aspect of the child's experience in order to develop a comprehensive treatment plan.

While choosing the treatment approach, the clinicians must keep in mind, to be sensitive to cultural and linguistic attributes of the child and address the goals within the World Health Organization's (WHO) International Classification of Functioning (ICF) Framework (ASHA, 2007; Coleman & Yaruss, 2014; Yaruss, 2007; Yaruss & Quesal, 2004; 2006).

2.4.3 Evidence- Based practices for treatment of Stuttering in Children

Many case studies reported by Goldiamond (1965) demonstrated the benefits of substituting stuttered speech with a new speech pattern known as "prolonged speech." During this treatment program, clients used the new speech pattern to reduce stuttering using short utterances or slow rate of speech, and programmed instruction to shape this new speech pattern to more natural-sounding speech (Boberg & Kully, 1985; Curlee & Perkins, 1969; Howie et al., 1981; Ingham, 1981, 1987; Shames & Florance, 1980; Webster, 1980). The core idea of the prolonged speech technique originally was to produce slow speech by prolonging the vowels. However, in recent years, this technique has adopted various combinations of soft articulatory contacts, smooth transition between sounds, the gentle onset of words, and exaggerated continuity of speech.

Prolonged speech helps children who are transitioning from preschool to school to learn various speech production strategies. It is easier to teach fluency

facilitating techniques as the child develops metalinguistic awareness,that demand conscious control over speech-motor mechanisms. (Blomgren M, 2013). A semi-experimental study conducted by Zamani P, et al. (2001) on 30 school-age (8-14 years old) boys diagnosed with mild stuttering who received intensive speech therapy using prolonged speech reported that this technique might be an efficient treatment as they could maintain increased fluency even after its termination.

Rhythmic speech technique given by Brady (1971) proposed that pacing words or syllables to a rhythmic stimulus reduces or eliminates stuttering. According to the timing theories, rhythmic speech provides more time and hence reduces the stuttering behavior. Also, according to the prosodic theory, the stress and intonation in rhythmic speech doesn't change as a result of which stuttering reduces.

Pacing speech using an externally generated stimulus, such as a metronome, leads to decreased dysfluencies in stutterers (Barber, 1940; Brady, 1969). Greenberg (1970) studied the influence of a metronome in children who stutter between 9-11 years. He reported that the distracting effect of the metronome makes the person with stuttering allocate all of his resources for producing fluent speech to overcome the distraction. Van Riper (1973) strongly opposed the use of rhythmic speech exercises in adults with stuttering, recommended their use, to provide an experience of smooth speech flow in young children with stuttering. He suggested several rhythmic activities, such as body motions combined with speech, rehearsing rhymes, and practicing "Indian talk" to facilitate fluency. Coppola and Yairi (1982) reported that rhythmic speech using a desktop metronome could be taught to preschool children with stuttering. Thus, metronome can not only be used for adults but also for children.

Children need to understand how fluent production of speech is different from stuttering. Williams (1979) highlighted that normal talking makes use of the pulmonary airflow and how it is modified into speech by various articulators making contacts at a different point in time. Any disruption in the speech process can result in stuttering. These may include abrupt respiration, sudden onset of phonation, or tense posturing of the articulators during speech production. The clinician must be able to demonstrate and model behaviors instead of giving out information about the disrupted process and changes in the normal speech production mechanism.

Conture (1990) described some effective ways to teach children about the disruptions that occur in the speech mechanism and how it interferes with the fluent production of speech. For example, "Lily pad" and “Thumb and opposing fingers” analogy are useful in helping the child understand what he/she must do to increase speech fluency. This indicates that speech involves a smooth continuous movement from sound to another. The first analogy involves pretending a frog or the child jumping from one lily pad to the next to cross stream. The child has to pretend that each pad is a like a letter of a word and he/she must hop from the bank to the first pad, then to the next pad and so on until he/she arrives at the other bank. The clinician explains that he/she will get wet, go to the bottom of the creek, have to climb out and start all over again if he/she stands too long on any particular lily pad (i.e., prolongation of a sound). Similarly, if the child hops on the same lily pad several times or for long time (i.e., repetition of a sound), he/she has to start all over again. The clinician explains to the child that it is necessary to produce each word in a smooth, quick manner with ease. This analogy is more useful for younger children.

For older children, teenagers, and adults, the author suggested using one of our thumbs and its opposing four fingers in much the same way. Here each finger is

a letter or sound of a short word, and our opposing thumb is like the tongue or the speech system that is used to produce each letter or sound. The clinician explains that for fluent speech, the thumb should move slowly and sequentially with ease from one finger to another. Conversely, dysfluent speech is described as pressing the client's thumb and any one of its opposing fingers (i.e., a fixed articulatory posture or audible/inaudible sound prolongation) for too long with too much force between or repeatedly contacting the thumb and one particular finger (i.e., sound/syllable repetition). Through these analogies, the child can focus on "those things he/she does that interfere with speech and what is necessary for him/her to change to speak more fluently. A procedure of reducing behaviors through response-contingent withdrawal of tangible reinforcers is called Response cost. Response cost is implemented most effectively and efficiently in a token system. Tokens are presented and withdrawn depending on the behavior. It is effective with young children for whom fluency shaping is not a good option. It doesn't affect the speech rate and speech naturalness.

An experimental study completed with 40 preschoolers aged between 2.6-6 years at the California State University-Fresno supported the use of Response cost (Hegde, 2004). Studies done by Rickard & Mundy, 1965; Browning, 1967; Leach, 1969 reported the use of token systems in stuttering management. However, these are based on single case study reports in which stuttering was modified within short periods of therapy time. Shaw and Shrum (1972) administered reinforcement for fluency with 3 CWS between the ages of 9 and 11 years. There was a marked improvement in fluency that had persisted for one child and four months in another. The study done by Seth D, Maruthy S (2020) investigated the efficacy of RC treatment in Kannada-speaking preschool CWS. Five preschool CWS were recruited for the study. Spontaneous speech samples were evoked from all participants at

several time points. The outcomes of the study provide the first documentation of use of RC in Kannada-speaking preschool CWS. The treatment outcomes were positive with significant reduction in disfluencies and severity rating for all participants without altering the speech naturalness. Further, associated motor behaviors were also found to have eliminated once the disfluencies reduced.

2.3 Telerehabilitation

"Telehealth or telemedicine is the use of information technology and telecommunications to support or deliver health services (Project for Rural Health Communications and Information Technology, 1996)." It has a high potential to provide treatment services overcoming the access barriers existing in many countries (Wilson et al., 2002). It has been a feasible alternative to the in-person service delivery models in medical and allied health services (Craig et al.,1999; Elford et al., 2000; Krumm et al., 2004; Schopp et al., 2000; Wootton et al., 2000).

Telepractice (ASHA, 2014) is designed to use telecommunications technology to link "clinician to client/patient or clinician to clinician for assessment, intervention, and/or consultation." It has been experimented and accepted by professionals with free software applications and high-speed internet connectivity.

Telepractice has been used to deliver services to persons with various communication disorders, such as neurogenic communication disorders (Armfield et al., 2012; Georgeadis et al., 2004; Theodoros et al., 2008); voice disorders (Halpern et al., 2012; Howell et al., 2009); childhood speech-language disorders (Grogan-Johnson et al., 2009); and stuttering disorders (Carey et al., 2012; Lewis, Packman, Onslow, Simpson, & Jones, 2008; Irani & Gabel, 2011; O'Brian et al., 2008; Sicotte et al., 2003; Wilson et al., 2004).

This alternative service delivery model has various advantages with respect to planning, scheduling, delivering, and accessing treatment (Blaisier et al., 2013; Kully, 2002). Current barriers to telepractice include issues related to internet connectivity, confidentiality, professional licenses, and lack of payment for services (Cohn, 2012; Cohn et al., 2011; Denton, 2003).

2.3.1 Telepractice for Stuttering

Researchers have been exploring the various aspects of telepractice, its advantages and disadvantages as well.

Inexpensive and useful computer software, Speech Fluency Treatment, was studied by Awad in 1997. It worked by illustrating the client's speech irregularities by generating audio and visual cues. The real-time display of the client's speech served as feedback and provided a platform to compare with the reference speech profiles. Using this, the clients could alter their speech to improve fluency.

Kully (2000) used video conferencing for post-treatment consultation after two months with a client who completed an intensive Comprehensive Stuttering Program. The clinician and the client reported satisfaction with the session's structure and the effectiveness of the feedback.

A study conducted by Sicotte et al. in 2003, enrolled children and adolescents of ages 4-19 years with stuttering in telepractice assessment and treatment for 12-24 weeks. High satisfaction w.r.to decrease in the frequency of dysfluencies and improvement in communication skills was reported by both clinicians and clients. Thus, the author concluded that telepractice can be used to deliver therapeutic services efficiently.

Ai and Yunus (2007) presented a paper on a computer-based system tool to assess the efficacy of stuttering therapy techniques. Digital Signal Processing was used to analyze speech signals and incorporate recognized fluency shaping techniques like shadowing, using a metronome, and delayed auditory feedback into the software, post discussion with SLP. It provided real-time visual and audio feedback of the client's speech patterns and self-training assistance. The result of this study revealed that the software assisted SLPs in determining suitable techniques for each client.

In another case study (Irani & Gabel, 2011), an AWS was assigned an intensive three-week in-person therapy program. Then, the client was enrolled for treatment via telepractice, twice a week for six months, weekly once for another six months. A decline was observed in the frequency of syllables stuttered. Further, the participant reported a positive change in his attitudes and self-image. Thus, hybrid treatment programs could help deal with the core behaviors, attitudes, and emotions concerned with stuttering.

Valentine (2014) studied two school-age children to determine if telepractice was an effective means for generalization of skills in children who stutter. Treatment outcomes were evaluated across three intervention types: direct (Phase I), hybrid (i.e., direct plus telepractice) (Phase II), and telepractice-only (Phase III) during a 10-week treatment period. The direct treatment sessions were conducted at a university clinic. Telepractice was delivered using Skype and personal laptops. Measurements of fluency and the clients' attitudes toward his or her speech were conducted before and after treatment phases. Best- treatment results followed the direct-only treatment condition (Phase I). However, participants continued to make gains throughout the hybrid and telepractice-only phases.

Like the clinic-based services, telepratice also delivers services via videoconferencing, phone calls, and Internet software. Further, the telepractice targets to teach and practice the techniques, practice natural-sounding speech, learn to self-evaluate, generalize, and maintain fluent speech in various contexts.

McGill et al. (2018) reviewed seven studies, one of them on an adult, on telepractice for stuttering treatment. It was reported that the telepratice delivered almost similar levels of success as the traditional face-to-face therapy, valid with various programs like the Lidcombe program, Camperdown program, and integrated approach. Moderate to high satisfaction was rated by the clinicians who participated in these studies.

The literature in the field of stuttering provides opposite outcomes regarding the effectiveness of computer-based software. It is the client's right to be informed of the various stuttering management approaches and select appropriate treatments to meet his/her needs. Moreover, the whole management program is a decision taken in unison by the therapist and the client. The inclusion of a computer-based device into the management plan becomes an individual choice determined by each client's values and treatment objectives.

As there are variations in the disorder of stuttering concerning various aspects of every individual, a therapist needs more time to choose a preferable technique for each client. The module can assist therapists with trial and error methods to implement various combinations of techniques and decide regarding the best suitable technique.

Chapter 3

Method

The objectives of the present study were to develop a computer-based module that will aid in the intervention of CWS targeting the age group 5-15 years and to orient clinical practitioners of Speech-Language Pathology regarding the use of telepractice in rehabilitation.

This module is designed to assist the young clinicians in better understanding of the normal speech production physiology, dysfluencies in children with stuttering, and the various therapy techniques used to treat them.

The study was carried out in three phases:

Phase I: Pilot study to determine the need for a computer-based module for the rehabilitation of CWS.

Phase II: To develop the contents for the module and validation of the same by SLPs.

Phase III: To incorporate the validated content into a computer-based module and validation of the same by SLPs.

3.1 Phase I- Pilot study

3.1.1. Objective

As a part of this, a pilot study was conducted to evaluate various factors related to providing effective therapy for CWS. A questionnaire was developed as per the objectives of the study, to find out the need and importance of a computer-

based module for the rehabilitation of CWS. It also targeted the knowledge, experience, and confidence of SLPs while managing CWS in clinical practice.

3.1.2. Method

The questionnaire contained 15 items (including 5 subjective and 10 objective types) and was administered on randomly selected 12 SLPs with an experience of providing therapy to CWS for <1 year, 1-2 years, and >2 years (4 SLPs under each group). The general feedback was collected regarding the use of therapeutic aids and materials, and clinical utility of the same while providing therapy for CWS. The items in the questionnaire targeted the following aspects:

i. Confidence of clinician while providing therapy
ii. Experience in terms of the number of children (clients) they have handled
iii. Ability to demonstrate techniques appropriately
iv. Comprehensibility of the techniques by the clients
v. Use of any aids for the demonstration of techniques
vi. Ability to prepare appropriate lesson plans by the SLPs
vii. Ease of access of therapeutic aids/materials for providing therapy
viii. Maintenance of progress record on day to day basis
ix. Confidence in counseling
x. Ability to determine the prognosis
xi. View about a computer-based therapeutic module- whether it would help overcome the problems faced in the items mentioned above

Also, certain subjective questions were asked regarding the various facilities that a computer-based module should be offering for the management of CWS.

3.2. Phase II- Module Development

3.2.1. Content preparation

Stuttering is a heterogeneous disorder. There are numerous techniques suggested by various authors. The content for the module was prepared by compiling information from various evidence-based practices used in stuttering management. The content includes the following:

a. Overview of module
b. Overview of the stuttering disorders in children
    - Brief information using audio-video and animated materials about stuttering including signs, causes, severity, assessment, treatment, and myths and facts
c. Animated demonstration of the mechanism of fluent speech production
    - Role of various subsystems involved in the mechanism of fluent speech production
d. Awareness regarding the types of dysfluencies
    - Brief information and demonstration through audio-video samples
e. Pre-therapy base-rating
    - Brief instructions provided for recording various tasks
    - Recording sheet for storing details
f. Description and animated demonstration of evidence-based therapy techniques
g. Strategies to be followed while speaking to a child who stutters
h. General tips for the parents who have CWS
i. Documentation of the progress in the clients' fluency using the recording sheet

The author and the guide prepared the content and videos after referring to various resources on stuttering management.

3.2.2. Development of animation and videos

Animations were designed by a team of three members pursuing their bachelors in design from IIT Mumbai. Description of each animation is as follows:

i. Animation for Light contacts: It is illustrated and animated using Procreate software.

ii. Animation for Prolongation technique: It is illustrated using Adobe Illustrator software, animated using Adobe After Effects application, edited video using Adobe Premiere Pro app, and coded using Adobe Animate CC program.

iii. Animation for Slow rate speech: It is illustrated using Adobe Illustrator software, animated using Adobe After Effects application, edited video using Adobe Premiere Pro app, and coded using Adobe Animate CC program.

iv. Animation for Lilypad analogy: It is illustrated using Adobe Illustrator software, animated using Adobe After Effects application, edited video using Adobe Premiere Pro app, and coded using Adobe Animate CC program.

v. Animation for Finger thumb analogy: It is illustrated and animated using Procreate software and coded using Adobe Animate CC program.

vi. Animation for Response cost: It is illustrated using Adobe Illustrator software and coded using Adobe Animate CC program.

vii. Animation for Reinforcement: It is illustrated using Adobe Illustrator software, animated using Adobe After Effects application, edited video using Adobe Premiere Pro app, and coded using Adobe Animate CC program.

Videos describing various types of dysfluencies were recorded using a Digital single-lens reflex camera, Canon EOS 80D.

Further, the design, color, animations, transitions, and overall features were finalized by the author, guide, speech technologist, and animation designers.

3.2.3. Validation of the content

The questionnaire contained 10 items (yes/no questions) and was given to 10 SLPs with an experience of 2 years of providing therapy to CWS. The general feedback was collected regarding the content, videos, and animations developed for the computer-based module. The items in the questionnaire targeted the following aspects:

a. Applicability/utility of the techniques chosen to the clinical setting

b. Length of the module

c. Appropriateness of the animations and videos for each of the techniques and types of dysfluencies respectively

d. Usage of animations with respect to its controls and if it is interesting for CWS during therapy

e. Usefulness of the module to complement and supplement the knowledge of SLPs and other team members (client/caregivers) with respect to stuttering management.

Also, the SLPs were asked to provide suggestions to improve the contents of the module, including the written content, animations, and videos

3.3. Phase III- Computerized version of the module

The Computer-based module was called as the Assistive Stuttering Interface-Children (ASI-C). It was designed by a speech technologist using HTML, CSS and JavaScript.

3.3.1. Feedback regarding the computerized version of the module

The questionnaire contained 10 items (yes/no questions) and was given to the 10 SLPs who participated in Phase II of the study. The general feedback was collected regarding the computer-based module. The items in the questionnaire targeted the following aspects:

1. Framework of the contents of the module
2. Ease of use & accessibility
3. Visual display of the module
4. Technical issues
5. Utility in teletherapy

Chapter 4

Results and Discussion

The objectives of the present study were, to develop a computer-based module that will aid in the intervention of CWS targeting age group 5-15 years and to orient clinical practitioners of Speech-Language Pathology regarding the use of telepractice in rehabilitation.

4.1. Phase I- Pilot study

The pilot study was conducted to evaluate various factors related to providing effective therapy for CWS. The questionnaire developed and administered on randomly selected 12 SLPs, had 15 items (including five subjective and 10 objective types). It was administered to find out the need and importance of a computer-based module for CWS therapy. Table 1 depicts the responses.

Table 1

Pilot study

PARAMETERS	**EXPERIENCE**					
	< 1 YEAR		1-2 YEARS		>2 YEARS	
	YES	NO	YES	NO	YES	NO
1. Are you confident to provide therapy for adults with stuttering?	3	1	3	1	4	-
2. Can you demonstrate the techniques to your clients appropriately?	4	-	4	-	4	-

3. Can your clients understand the techniques that you have demonstrated?	3	1	3	1	4	-
4. Do you use any aids to demonstrate the techniques?	2	2	2	2	2	2
5. Can you prepare a structured therapy plan for various techniques?	2	2	3	1	3	1
6. Can you access the therapeutic materials for stuttering easily?	2	2	2	2	4	0
7. Do you maintain a proper record of the progress of your client on day to day basis?	2	2	3	1	3	1
8. Are you confident in counseling your clients about effective home training?	4	-	4	-	3	1
9. Is it easy to determine the prognosis for your clients?	3	1	3	1	3	1
10. Do you think a module for stuttering would help with techniques, tasks and progress report making?	4	-	4	-	4	-

All the SLPs were able to demonstrate techniques to the clients appropriately. However, two of them reported that their clients faced difficulty in understanding the techniques. 10 of the 12 SLPs reported that they were confident in providing therapy to CWS. Eight of the 12 participants could access therapeutic materials, but only

50% of all the clinicians used aids to demonstrate techniques. Eight clinicians reported that they were able to prepare appropriate therapy plans, and only four of them were maintaining the progress report daily. Determining the prognosis was reported to be difficult by three of the 12 participants.

A list of features and support expected from the module was gathered from the participants. The recommendations made were:

a) A game based software program should be developed.

b) Distinguishing between NNF and Stuttering.

c) Must include demonstration videos of various techniques, analogies.

d) Inclusion of activities during each phase.

e) Focus on improving speech naturalness.

f) Must include the use of reinforcement strategies and feedback systems.

g) Documentation of progress based on stages or phases; session report at the end of the session- using various quantitative and qualitative methods.

The study revealed that the clinicians did face therapeutic issues in some aspects while dealing with CWS. All 12 clinicians responded positively to a computer-based module and justified that it would support and guide them throughout the therapy programs. They also reported that it would help young clinicians learn the techniques and demonstrate them appropriately and confidently. This supports an earlier study conducted by Sicotte et al. in 2003, who enrolled children and adolescents of ages 4-19 years with stuttering in telepractice assessment and treatment for 12-24 weeks. Clinicians and clients reported high satisfaction with respect to decrease in the frequency of dysfluencies and improvement in

communication skills. Thus, the author concluded that telepractice could be used to deliver therapeutic services efficiently.

McGill et al., (2018) reviewed seven studies, six of them on children, on telepractice for stuttering treatment. It was reported that the telepratice delivered almost similar levels of success as the traditional face-to-face therapy, valid with various programs like the Lidcombe program, Camperdown program, and integrated approach. Moderate to high satisfaction was rated by the clinicians who participated in these studies.

Since all the twelve SLPs recommended the clinical utility of a computer-based module for rehabilitation, the need for the current study was met.

4.2. Phase II- Module development

The content and videos for the module were prepared by compiling information from various evidence-based practices used in stuttering management. Animations were developed by a team of three members, pursuing bachelor in design from IIT Mumbai, the author, and the guide.

A questionnaire was developed and administered on 10 qualified SLPs, which contained 10 items (yes/no questions). General feedback was collected regarding the content, videos, and animations developed for the computer-based module. Table 2 depicts the responses.

Table 2

Content Validity

QUESTIONS	YES	NO
1. Are the techniques chosen, relevant to our clinical set-up?	10	-
2. Do you feel the module is lengthier, considering the contents?	-	10
3. Are the animations in accordance with techniques mentioned?	10	-
4. Do you think the animations made are interesting for the client?	10	-
5. Are the animations easy to use in terms of using the controls?	10	-
6. Does the module complement your theoretical knowledge?	10	-
7. This module was prepared with the intention to provide relevant information about stuttering for clinicians, clients, parents, and caregivers. Do you think the same objective is met?	10	-
8. Are the videos demonstrating the contents (signs of stuttering, types of dysfluencies, etc) of the module comprehensive/appropriate?	10	-

9. Do you think that this module can be used to treat stuttering of various severities?	10	-
10. Do you think the content of the module is comprehensive to clinicians with varying experiences in stuttering rehabilitation (Undergraduate/ Postgraduate)?	10	-

All the 10 SLPs validated the content and mentioned that the module would provide relevant information about stuttering to the children, parents, and caregivers. Further, the suggested modifications were incorporated while making the final content of the module. The suggestions included improving the audio quality of the videos demonstrating the techniques, replacing an animation that seemed inappropriate, and including the instructions for using the animations in the module.

4.3. Phase III- Computerized version of the module

The computerized version of the module was developed using HTML, CSS, and JavaScript. A questionnaire containing 12 items (yes/no questions) was developed and administered for validating the computerized version of the module on the participants of Phase II of the study to obtain a consensus regarding the same. The general feedback was collected regarding the computer-based module. Table 3 depicts the responses.

Table 3

Feedback regarding the computerized version of the module

QUESTIONS	YES	NO
1. Are the contents of the computer-based module well-organized and easily accessible?	10	-
2. Do you feel the computer-based module would help in providing therapy?	10	-
3. Is the computer-based module user-friendly in the clinical set-up?	10	-
4. Are the instructions mentioned in the module for the techniques, simple and easy to follow?	10	-
5. Is the module visually appealing? (For ex: font, color, background etc)	10	-
6. Do you think that the animations are in accordance with the technique mentioned?	10	-
7. Are the animations easy to use in terms of using the controls?	10	-
8. Did you face any technical issue while using the module?	10	-
9. Do you think there will be a better clinical utility of the module if made into a mobile phone application?	8	2

10. Do you think this module can be used in teletherapy?	10	-
11. Do you think hybrid mode of intervention (in-person service delivery + teletherapy) is more beneficial than each of them when used alone?	10	-
12. Do you think this module will be more useful for children or adults or both?	Both (10)	-

All the SLPs gave positive feedback regarding the computerized version of the module. Various aspects of the module were evaluated using the questionnaire, and all the participants reported that the framework of the contents in the module was well organized. All the SLPs agreed on the ease of use of the videos, animations, their controls, and accessibility of the contents. The module was reported to be visually appealing by all the SLPs in terms of the layout, background, font, and color. No major technical issues were reported. However, clinicians had concerns with respect to the utility of the computer-based module in the clinical setup. One of the participants highlighted that the module might not be used at all times, especially when there are internet connectivity issues. There were comments on enhancing the visual appeal of the module in terms of highlighting the important points. Some clinicians faced issues with the speed of animations, audibility in the videos, which were addressed in the final revision of the module.

However, all the participants agreed that the computer-based module could be beneficial in providing therapy via both in-person and distance mode. This supports a previous study by Awad (1997) who presented a paper on computer

software, Speech Fluency Treatment, for illustrating the client's speech irregularities using audio and visual cues. This served as feedback to the client and helped alter various aspects of speech fluency.

Ai and Yunus (2007) presented a paper on a computer-based system tool to assess the efficacy of stuttering therapy techniques. It incorporated techniques like shadowing, using a metronome, and Delayed Auditory Feedback (DAF). The software provided real-time visual and audio feedback. The result of this study revealed that the software assisted SLPs in determining suitable techniques for each client.

Also, all the clinicians agreed on the usefulness of the computer-based module while providing therapy using the hybrid mode that combines in-person service delivery and telerehabilitation. This supports an earlier study by Valentine (2014) to determine the effectiveness of telepractice in the generalization of skills in CWS. Best outcomes were observed for in-person modality. However, participants also showed improvements with both hybrid and telepractice-only mode. Thus, hybrid treatment programs can help in providing successful rehabilitation services

Chapter 5

Summary and Conclusion

The main objectives of this study were to develop a computer-based module that would aid in the intervention of CWS targeting age group 5-15 years and to orient clinical practitioners of Speech-Language Pathology regarding the use of tele-practice in rehabilitation.

The study was carried out in three phases. In Phase I, a pilot study was conducted to determine the need for a computer-based module for the rehabilitation of CWS. Phase II comprised of the development of the contents for the module and validation of the same by SLPs. Phase III was accomplished by incorporating the validated content into a computerized version which was further subjected to feedback by SLPs.

A computer-based module was developed with the aim of providing a comprehensive platform for the clinicians to gather better understanding of the different treatment techniques. This module was created to supplement their clinical knowledge to improve service delivery in stuttering rehabilitation. The study was first carried out from the pilot, where the information was sought regarding the computer-based module and its efficacy. Then, the contents of the module were prepared and subjected to content validity. Modifications were made and incorporated into the computer-based module, depending upon the suggestions obtained. The computer-based module was developed using HTML, CSS, and JavaScript. The module comprised of

- Overview to the module

- Overview of stuttering- including the causes, signs, assessment, treatment, and myths and facts
- Speech production mechanism
- Normal non-fluency
- Types of dysfluencies
- Pre-therapy base rating and recording sheet
- Therapy techniques
- Listener strategies, and
- General tips to be followed.

The recording sheet is designed to document the demographic details of children and quantify the severity of stuttering. It can also be used to document and track the progress at regular intervals. The types of dysfluencies and therapy techniques were demonstrated using videos. Also, automatic and manual animations were included for the learning of the techniques. These animations can also be used during generalization, self-monitoring, and maintenance phases of therapy.

There are multiple advantages to this module.

The benefit to the clinicians:

- It is one of the first modules to be developed at AIISH for stuttering management.
- Brief concepts regarding stuttering are given, including the signs, causes, normal non-fluency, types of dysfluencies, assessment, and management.

- It includes a visual representation of normal speech production mechanism, types of dysfluencies, and therapy techniques, which will help the clinicians explain better to the children, parents/caregivers about stuttering.
- It will aid in delivering better therapeutic services in stuttering management.
- It will be useful for clinician training.

The benefit to the clients:

- Visual representations of various aspects, including speech production mechanism, types of dysfluencies, and therapy techniques, are provided for a better understanding of stuttering.
- The therapeutic techniques are explained in detail, which will help clients to follow every step with ease.
- Animations and videos are provided for various techniques, which will assist in better learning, understanding, and practice in every speaking task.
- Clinician controlled visual feedback is provided, which will further help in learning and practicing the techniques.
- It can be used to provide teletherapy with remote desktop access tools (TeamViewer/AnyDesk) installed in the client's and clinician's computers.
- It is cost-effective and time-effective as people do not have to travel to avail services.

Limitations and future directions:

- Internet connectivity is required in order to access the computer-based module. Hence, this can be upgraded into an internet-free version.

- There may be constraints to the module's usage as it has been developed in English language. This module could be translated into various languages to benefit more individuals with stuttering.
- The manually controlled animations have an average speed of response. They can be modified and upgraded using sophisticated tools in future.
- The module comprises of only four evidence-based techniques. Thus, more evidence-based techniques can be incorporated for clinician training and clinical utility.
- The provision for the audio-video recording of the speech sample would be beneficial for the clinicians in the clinical setup.
- Various activities can be provided in the module for each phase to make the learning of the techniques more interesting.
- Evidence-based methods for improving speech naturalness can be included.
- Field-testing of the module can be taken up to check for efficacy.

To conclude, this module has been developed as a training supplement and as a rehabilitation aid. We hope that this computer-based module is used extensively by the clinicians in stuttering rehabilitation, and paves a new path in telerehabilitation for stuttering.

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Appendix

QUESTIONNAIRE 1- Pilot study

1) Are you confident to provide therapy for

   i. Adults with stuttering?

      a) Yes b) No

   ii. Children with stuttering?

      a) Yes b) No

2) Can you demonstrate the techniques to your clients appropriately?

   a) Yes b) No

3) How many techniques do you have a sound knowledge of?

   i. Prolonged Speech

      a) 0-25% b) 26-50% c) 51-75% d) 76-100%

   ii. Modified Airflow

      a) 0-25% b) 26-50% c) 51-75% d) 76-100%

   iii. Relaxation

      a) 0-25% b) 26-50% c) 51-75% d) 76-100%

   iv. Slow rate of speech

      a) 0-25% b) 26-50% c) 51-75% d) 76-100%

   v. Soft articulatory contacts

      a) 0-25% b) 26-50% c) 51-75% d) 76-100%

   vi. Pause and talk

      a) 0-25% b) 26-50% c) 51-75% d) 76-100%

   vii. Metronome

a) 0-25% b) 26-50% c) 51-75% d) 76-100%

viii. Altered auditory feedback- DAF/FAF/MAF

a) 0-25% b) 26-50% c) 51-75% d) 76-100%

ix. Finger thumb

a) 0-25% b) 26-50% c) 51-75% d) 76-100%

x. Lily Pad

a) 0-25% b) 26-50% c) 51-75% d) 76-100%

xi. Response cost

a) 0-25% b) 26-50% c) 51-75% d) 76-100%

xii. Van Riper's traditional approach

a) 0-25% b) 26-50% c) 51-75% d) 76-100%

xiii. GILCU (Gradual increase in length and complexity of utterance)

a) 0-25% b) 26-50% c) 51-75% d) 76-100%

xiv. Time out

a) 0-25% b) 26-50% c) 51-75% d) 76-100%

xv. Cognitive Behavioral Therapy

a) 0-25% b) 26-50% c) 51-75% d) 76-100

4) How did you learn these techniques?

a) Supervisors b) Internet c) Existing videos in the unit d) Seniors

5) Mention the techniques that you would often use during therapy. Specify for adults and children separately.

6) Can your clients understand the techniques that you have demonstrated?

i. Adult

a) Yes b) No

ii. Children

a) Yes b) No

7) Do you use any aids to demonstrate the techniques?

i. Adult

a) Yes b) No

If yes, mention.

ii. Children

a) Yes b) No

If yes, mention.

8) Can you prepare a structured therapy plan for various techniques?

i. Adult

a) Yes b) No

ii. Children

a) Yes b) No

9) Can you access the therapeutic materials for stuttering easily?

i. Adult

a) Yes b) No

ii. Children

a) Yes b) No

10) Do you maintain a proper record of the progress of your client on day to day basis?

a) Yes b) No

11) Are you confident in counselling your clients/ parents about effective home training?

a) Yes b) No

12) Is it easy to determine prognosis for your clients?

a) Yes b) No

i. How do you rate your success in providing therapy for stuttering?

a) 25% b) 50% c) 75% d) 100%

13) Mention how you will quantify the progress.

14) Do you think computer software program for stuttering would help with techniques, tasks and progress report making?

a) Yes b) No

15) What contents/features/components/support would you expect in a software for stuttering therapy? Mention separately for children and adults.

QUESTIONNAIRE 2- Content Validity

1. Are the techniques chosen, relevant to our clinical set-up?

2. Do you feel the module is lengthier, considering the contents?
3. Are the animations in accordance with techniques mentioned?
4. Do you think the animations made are interesting for the client?
5. Are the animations easy to use in terms of using the controls?
6. Does the module compliment your theoretical knowledge?
7. This module was prepared with the intention to provide relevant information about stuttering for clinicians, clients, parents, and caregivers. Do you think the same objective is met?
8. Are the videos demonstrating the contents (signs of stuttering, types of dysfluencies, etc) of the module comprehensive/appropriate?
9. Do you think that this module can be used to treat stuttering of various severities?
10. Do you think the content of the module is comprehensive to clinicians with varying experiences in stuttering rehabilitation (Undergraduate/ Postgraduate)?

QUESTIONNAIRE 3- Feedback regarding the computerized version

1. Are the contents of the computer-based module well-organized and easily accessible?
2. Do you feel the computer-based module would help in providing therapy?
3. Is the computer-based module user-friendly in the clinical set-up?
4. Are the instructions mentioned in the module for the techniques, simple and easy to follow?
5. Is the module visually appealing? (For ex: font, color, background etc)

6. Do you think that the animations are in accordance with the technique mentioned?
7. Are the animations easy to use in terms of using the controls?
8. Did you face any technical issue while using the module?
9. Do you think there will be a better clinical utility of the module if made into a mobile phone application?
10. Do you think this module can be used in tele-therapy?
11. Do you think hybrid mode of intervention (in-person service delivery + tele-therapy) is more beneficial than each of them when used alone?
12. Do you think this module will be more useful for children or adults or both?

Computerized version of the module: Assistive Stuttering Interface- Children

The **Assistive Stuttering Interface- Children**, a module for stuttering management, was developed by Ms. Parnika K. M, under the guidance of Dr. Anjana B Ram, Assistant Professor in Speech Pathology, as a part of Master's Dissertation (2019-20) at AIISH, Mysuru. The computerized version of the module was developed by Mr. Karthik Venkat Sridaran, Speech Technologist, AIISH.

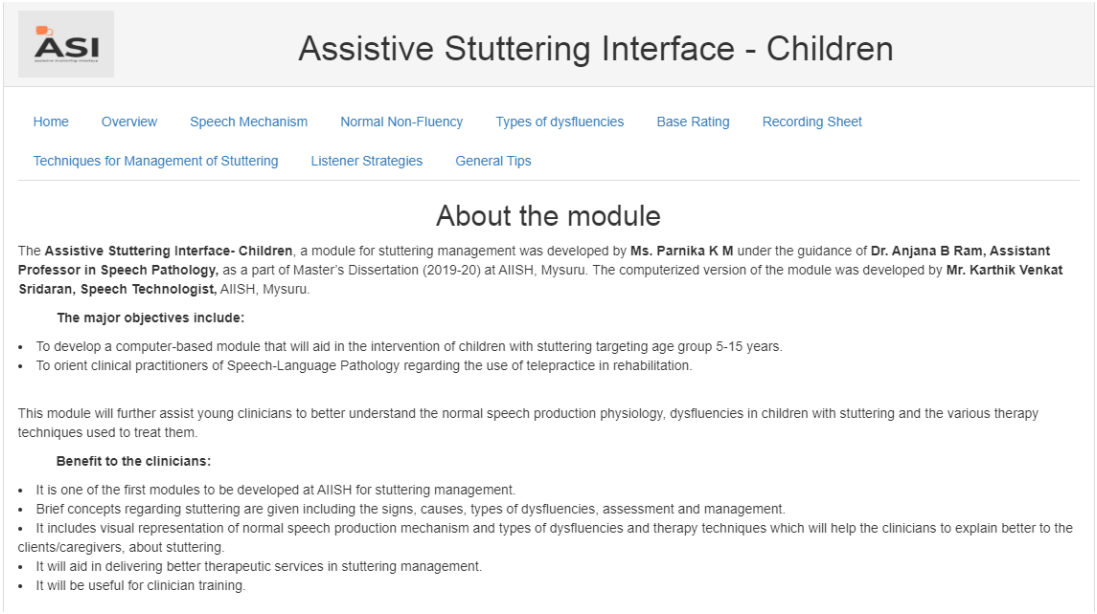
The major objectives include:

1. To develop computer-based module that will aid in intervention of children with stuttering.

2. To orient clinical practitioners of Speech-Language Pathology regarding the use of telepractice in rehabilitation.

This module was developed assist the young clinicians to better understand the normal speech production physiology, dysfluencies in children with stuttering and therapy techniques.

Here are few excerpts from the computerized version of the module:



Assistive Stuttering Interface - Children

Home Overview Speech Mechanism Normal Non-Fluency Types of dysfluencies Base Rating Recording Sheet

Techniques for Management of Stuttering Listener Strategies General Tips

About the module

The **Assistive Stuttering Interface- Children**, a module for stuttering management was developed by **Ms. Parnika K M** under the guidance of **Dr. Anjana B Ram, Assistant Professor in Speech Pathology,** as a part of Master's Dissertation (2019-20) at AIISH, Mysuru. The computerized version of the module was developed by **Mr. Karthik Venkat Sridaran, Speech Technologist,** AIISH, Mysuru.

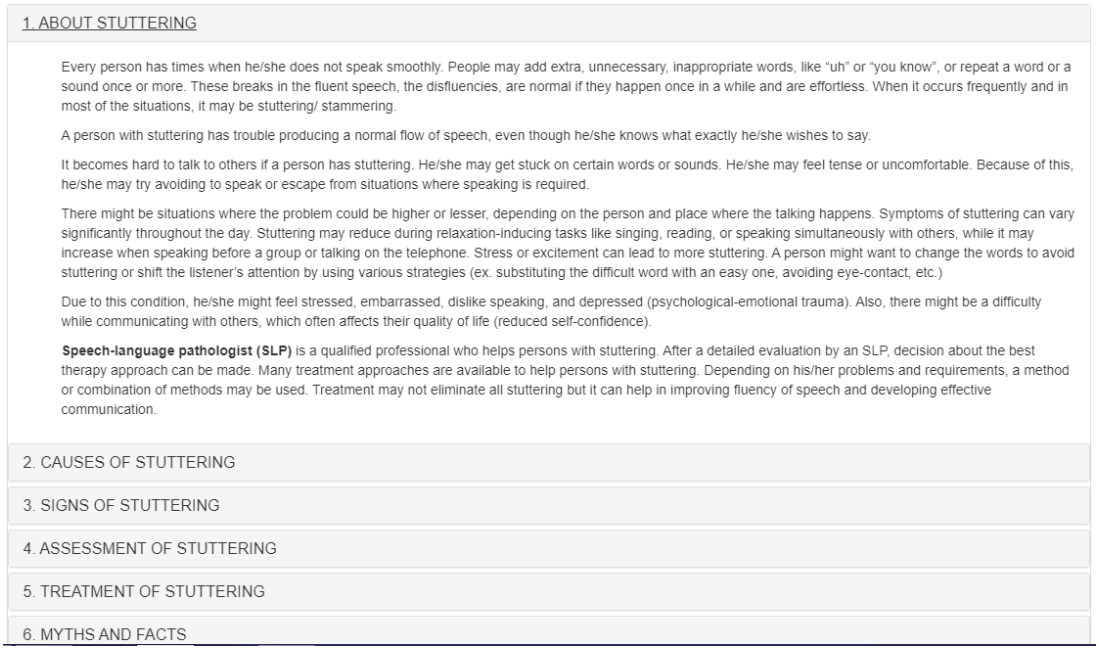
The major objectives include:

- To develop a computer-based module that will aid in the intervention of children with stuttering targeting age group 5-15 years.
- To orient clinical practitioners of Speech-Language Pathology regarding the use of telepractice in rehabilitation.

This module will further assist young clinicians to better understand the normal speech production physiology, dysfluencies in children with stuttering and the various therapy techniques used to treat them.

Benefit to the clinicians:

- It is one of the first modules to be developed at AIISH for stuttering management.
- Brief concepts regarding stuttering are given including the signs, causes, types of dysfluencies, assessment and management.
- It includes visual representation of normal speech production mechanism and types of dysfluencies and therapy techniques which will help the clinicians to explain better to the clients/caregivers, about stuttering.
- It will aid in delivering better therapeutic services in stuttering management.
- It will be useful for clinician training.



1. ABOUT STUTTERING

Every person has times when he/she does not speak smoothly. People may add extra, unnecessary, inappropriate words, like "uh" or "you know", or repeat a word or a sound once or more. These breaks in the fluent speech, the disfluencies, are normal if they happen once in a while and are effortless. When it occurs frequently and in most of the situations, it may be stuttering/ stammering.

A person with stuttering has trouble producing a normal flow of speech, even though he/she knows what exactly he/she wishes to say.

It becomes hard to talk to others if a person has stuttering. He/she may get stuck on certain words or sounds. He/she may feel tense or uncomfortable. Because of this, he/she may try avoiding to speak or escape from situations where speaking is required.

There might be situations where the problem could be higher or lesser, depending on the person and place where the talking happens. Symptoms of stuttering can vary significantly throughout the day. Stuttering may reduce during relaxation-inducing tasks like singing, reading, or speaking simultaneously with others, while it may increase when speaking before a group or talking on the telephone. Stress or excitement can lead to more stuttering. A person might want to change the words to avoid stuttering or shift the listener's attention by using various strategies (ex. substituting the difficult word with an easy one, avoiding eye-contact, etc.)

Due to this condition, he/she might feel stressed, embarrassed, dislike speaking, and depressed (psychological-emotional trauma). Also, there might be a difficulty while communicating with others, which often affects their quality of life (reduced self-confidence).

Speech-language pathologist (SLP) is a qualified professional who helps persons with stuttering. After a detailed evaluation by an SLP, decision about the best therapy approach can be made. Many treatment approaches are available to help persons with stuttering. Depending on his/her problems and requirements, a method or combination of methods may be used. Treatment may not eliminate all stuttering but it can help in improving fluency of speech and developing effective communication.

2. CAUSES OF STUTTERING

3. SIGNS OF STUTTERING

4. ASSESSMENT OF STUTTERING

5. TREATMENT OF STUTTERING

6. MYTHS AND FACTS

Assistive Stuttering Interface - Children

Home | Overview | Speech Mechanism | Normal Non-Fluency | Types of dysfluencies | Base Rating | Recording Sheet | Techniques for Management of Stuttering | Listener Strategies | General Tips

Normal Non-Fluency

"Not all disfluency is stuttering"

The developmental period of 2-6 years is very important as children are in the phase of language learning and communication development. During this period, they are mastering the adult forms of language and their speech tends to exhibit disfluencies. As children pass through the stages of language development, disfluencies may be more at certain times than others. Also, these developmental periods of disfluency are a normal occurrence.

These normal disfluencies are characterized by the repetition of whole words and phrases with occasional interjections of "uh", "er", "ah". This stage is transitional since most children leave behind the disfluencies as they master adult communication.

There is no need for therapeutic intervention for these children. However, children who go beyond simple repetitions and interjections to prolongation of sounds with signs of physical struggle while producing speech may be "incipient stutterers". You may see that, these children begin to repeat parts of words rather than the whole words and the frequency and duration of these disfluent episodes rise past normal expectations. Normally fluent speech is not effortful and the rhythm and rate don't call attention to themselves.

Distinguishing these normal deviations in fluency from those of stuttering is very important in the preschool period. Children are not only more disfluent during this period, but the onset of developmental stuttering is also found to be in the preschool period.

ANALOGIES

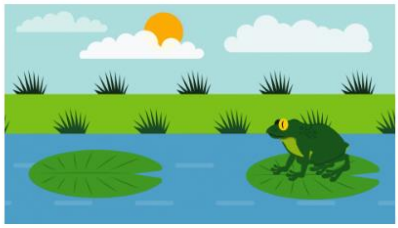
a) Lilypad Analogy

Let's play a game!! All you have to do is to speak as nicely as possible so that the frog is able to jump across the pond.

Therapist's Instructions: The frog has to cross the pond. With you talking, we'll help the frog to jump from one lilypad to the other. The way frog jumps on the lilypad will be controlled by the way you would be uttering each sound.

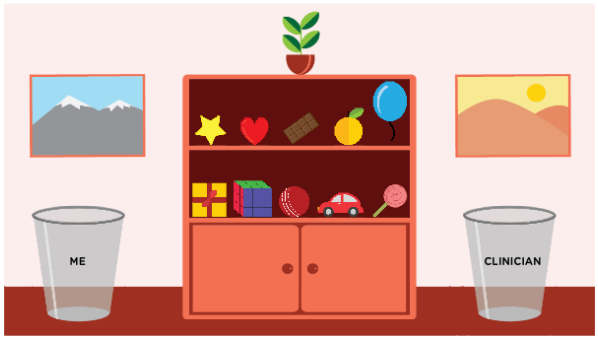
----------*Clinician's demonstration (with fluent and dysfluent speech)* ----------

Proceed to word level once the above step is achieved in sound level.



Instructions for using the animation:

- *Use "left arrow" key to jump to the next lilypad as the child speaks fluently.*
- *Use "up arrow" key to jump on the same lilypad to indicate dysfluencies.*



Instructions for using the animation:

- *Use the mouse to drag each token from the rack and put it into the child's bucket as he/she speaks fluently.*
- *Similarly, use the mouse to drag a token from the child's bucket and put it into the clinician's bucket as he/she experiences dysfluencies.*